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For related information see also *Astronautics*.

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 164
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 165
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 165
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 165
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 166
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 166

Note: N.A. means that no abstracts were assigned to this category for this issue.

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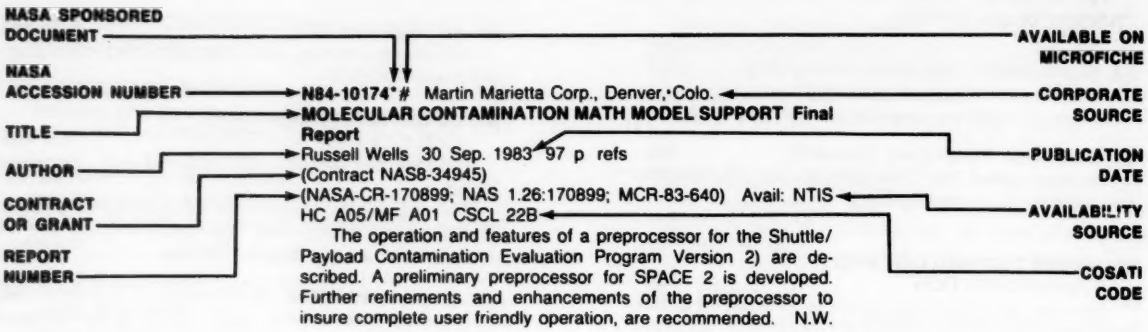
TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 1 / JANUARY 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-10001# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION, NO. 126
3 Oct. 1983 89 p Transl. into ENGLISH from various Russian articles
(JPRS-84457) Avail: NTIS HC A05

Transportation is the U.S.S.R. is discussed. Recent developments on air, rail, and marine transportation are outlined. Airports, air transport services, cargo shipments, railcar design, container ships, and ports are among the topics discussed. For individual titles, see N84-10002 through N84-10007. R.J.F.

N84-10002# Joint Publications Research Service, Arlington, Va.
MININSTER BUGAYEV PROMISES IMPROVED AEROFLOT SERVICES **c03**
B. Bugayev *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 1-2 Transl. into ENGLISH from Pravda (USSR), 21 May 1983 p 3 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

Plans to improve airline passenger service are discussed. Particular attention will be given to service to children, invalids, and persons requiring accelerated departure. R.J.F.

N84-10003# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER SVECHNIKOV ON CIVIL AVIATION CONSTRUCTION PROJECTS **c09**
In its USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 3-6 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 21 Apr. 1983 p 2 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

The construction and maintenance of airports are discussed. Ground management is discussed. Plans for future air terminals are discussed. R.J.F.

N84-10004# Joint Publications Research Service, Arlington, Va.
START AUTOMATED TRAFFIC CONTROL SYSTEM OPERATIONAL AT KRASNODAR **c04**
S. Omelchenko *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 7-8 refs Transl. into ENGLISH from Vozdushnyy Transport (USSR), 5 May 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

A recently installed automatic flight control system in the Krasnodar airport is discussed. Advantages of the new system are noted, as well as problems. The chief problem is a shortage of automatic transponders on the Yak-40 aircraft and their total absence on the L-410. R.J.F.

N84-10005# Joint Publications Research Service, Arlington, Va.
IMPROVED AIR SHIPMENT OF FRUIT REPORTED THIS YEAR **c03**
P. Protsenko *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 9-10 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 2 Jul. 1983 p 2 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

The shipment of fruit, especially cherries, is discussed. A bottleneck is identified at Arkhangel'sk airport. In response to complaints, shippers are told that perhaps they should not fly there. R.T.F.

N84-10006# Joint Publications Research Service, Arlington, Va.
UPGRADED YAKUTSK AIRPORT OPENS TO IL-62 SERVICE **c09**
O. Borodin *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 11-12 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 2 Jul. 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

The opening of a runway at Yakutsk airport is discussed. It can handle the landing of IL-62 aircraft. R.J.F.

N84-10007# Joint Publications Research Service, Arlington, Va.
UZBEK SSR CITY OF SHAKHRISABZ OPENS NEW AIRPORT: TOURISM PLANNED **c09**
Sh. Zaynutdinov *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 13 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 5 Jul. 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

The opening of a new airport in the city of Shakhrisabz is discussed. It is noted that the region is a tourist center, drawing thousands of visitors each year to look at monuments of antiquity. R.J.F.

N84-10008* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 165)
Sep. 1983 131 p
(NASA-SP-7937(165); NAS 1.21:7937(165)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 466 reports, articles and other documents introduced into the NASA scientific and technical information system in August 1983. Author

N84-10009 National Aeronautic Association, Washington, D. C.
WORLD AND UNITED STATES AVIATION AND SPACE RECORDS, AS OF JUNE 1, 1983
Milton M. Brown, ed. and Don Berliner, ed. 1983 358 p
Copyright. Avail: National Aeronautic Association, 821 15th Street, N.W., Washington, D.C. 20005; HC $9.95 plus $2.00 postage and handling

Ballooning, airship, landplane, seaplane, amphibian, rotorplane, glider and motorglider records are provided. Air cushion vehicles, speed over a recognized course, speed on a commercial air route,

feminine records, U.S. national records, parachuting, model airplanes, hang gliders, man powered aircraft, and air racing are also discussed. N.W.

N84-10010# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN, TECHNICAL PROGRAMME, 1984
Aug. 1983 35 p
(AGARD-BUL-83/2) Avail: NTIS HC A03/MF A01

A chronological listing of the meetings tentatively scheduled to take place during 1984 and a detailed description of the individual Panel Programs, the Consultant and Exchange Program, and the Military Committee Studies Program are included. The total budget required to support the proposed 1984 AGARD Technical Programme is presented. The Publication Summary identifies by activity the AGARD publications scheduled for publication in 1984. S.L.

N84-10011*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICS RESEARCH AND TECHNOLOGY PROGRAM AND SPECIFIC OBJECTIVES, FISCAL YEAR 1982
Walter B. Olstad 17 Jun. 1981 269 p
(NASA-TM-85474; NAS 1.15:85474) Avail: NTIS HC A12/MF A01 CSCL 01B

The Aeronautics Research and Technology program is broken down into two program areas (research and technology base, and systems technology programs) which are further broken down into succeedingly more detailed activities to form a work breakdown structure for the aeronautics program: program area, program/discipline objective, specific objective, and research and technology objective and plan (RTOP). A detailed view of this work breakdown structure down to the specific objective level is provided, and goals or objectives at each of these levels are set forth. What is to be accomplished and why are addressed, but not how. The letter falls within the domain of the RTOP. Author

N84-10012# General Accounting Office, Washington, D. C. Mission Analysis and Systems and Acquisition Div.
AIR FORCE AND NAVY TRAINER AIRCRAFT ACQUISITION PROGRAMS
5 Jul. 1983 37 p refs
(PB83-231076; GAO/MASAD-83-22; B-209123) Avail: NTIS HC A03/MF A01 CSCL 15E

The status of one Navy and two Air Force Programs to acquire 1,184 trainer aircraft is examined. Plans to acquire T-45 aircraft for training pilots need to be firmed up. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-10013 Pittsburgh Univ., Pa.
COMPUTATIONAL ANALYSES OF UNSTEADY FLOW PAST AIRFOILS WITH FLAPPING AND/OR PITCHING MOTION Ph.D. Thesis
Sheng Mao Huang 1982 159 p
Avail: Univ. Microfilms Order No. DA8305577

This study is aimed at a computational analysis of unsteady flows past airfoils undergoing flapping and/or pitching motion. Numerical solutions were obtained for flow past a flat plate, accelerated flow past a finite plate (rectangular airfoil) undergoing a flapping motion, pitching motion, or combined flapping and pitching motions, and for an accelerated flow past an airfoil with an upward motion. The numerical results of the boundary layer development over a flat plate were in agreement with those in the literature. For accelerated flow past a plate, the plate was first accelerated from the rest with a 15 deg angle of attack. The tangential component of the Reynolds number was increased linearly from 0 to 100, then to 29,000 at very rapid accelerations. Further computations were made for three oscillatory flows. They were caused by a flapping motion, pitching motion and combined flapping and pitching motions of the plate. All of these three cases had the same prescribed temporal variations in the angle of attack and the instantaneous Reynolds number but has different trajectories. Dissert. Abstr.

N84-10014 Notre Dame Univ., Ind.
EXPERIMENTAL STUDIES OF BOUNDARY LAYER TRANSITION ON A SPINNING AND NON-SPINNING AXISYMMETRIC BODY Ph.D. Thesis
Jerome Timothy Kegelman 1982 219 p
Avail: Univ. Microfilms Order No. DA8305873

An experimental investigation of natural and forced boundary layer transition on a secant ogive nose axisymmetric body was conducted for Reynolds numbers between 315,000 through 1,030,000. Two different modes of instability, a viscosity conditioned Tollmien-Schlichting instability as well as crossflow or inflectional instability were observed and documented. The boundary layer displacement thickness, momentum thickness and shape factors were determined in order to provide a complete data base for testing current transition theories. Wind tunnel freestream turbulence and sound pressure levels were measured to provide an estimate of the freestream disturbance environment. Velocity profiles and pressure distributions were documented and combined with flow visualization data to yield a more complete understanding of the transition processes. A considerable part of this investigation was directed toward the development of the wind tunnel equipment, instrumentation, and computer software necessary to obtain meaningful experimental data. Dissert. Abstr.

N84-10015 Washington Univ., Seattle.
A STUDY OF TRANSONIC NORMAL SHOCK WAVE-TURBULENT BOUNDARY LAYER INTERACTIONS IN AXISYMMETRIC INTERNAL FLOW Ph.D. Thesis
Deepak Om 1982 191 p
Avail: Univ. Microfilms Order No. DA8304405

An experimental investigation has been carried out in axisymmetric internal transonic flow to obtain mean flow data throughout the interactions produced by single normal shock waves and by multiple normal shock waves with a turbulent boundary layer. The purpose was to study the effects of Mach number, Reynolds number, and confinement of the flow on the interaction. Detailed pitot, static and wall pressure measurements were obtained upstream of, within, and downstream of a single normal shock wave turbulent boundary layer interaction for free stream Mach numbers of 1.48, 1.37 and 1.28 and a constant unit Reynolds number (based on free stream static temperature) of 4.92 x 10 to the 6th power per meter. In the analytical study, an approximate integral viscous in viscid interaction method is presented for calculating the development of a turbulent boundary layer subjected to a single shock induced adverse pressure gradient in an internal axisymmetric flow. Dissert. Abstr.

N84-10016# Cambridge Univ. (England).
THE CALCULATION OF STEADY AND UNSTEADY TRANSONIC FLOW IN CASCADES
D. S. Whitehead 1982 81 p refs
(CUED/A-Turbo/TR-118; ISSN-0309-6521) Avail: NTIS HC A05/MF A01

The steady flow and the unsteady flow in a cascade of compressor or turbine blades are calculated. The flow is assumed to be two dimensional and irrotational, but may be subsonic in some parts of the field and supersonic in other parts. A mesh of triangular finite elements is used. This was chosen because it enables a large number of small elements to be packed into the regions of greatest interest, such as round the leading edges of the blades, with larger elements in regions where there is not much variation. The steady flow equations are then solved by the Newton-Raphson technique. N.W.

N84-10017*# Kansas Univ., Lawrence. Flight Research Lab.
A LIFTING SURFACE THEORY IN ROTATIONAL FLOW Topical Report, Jun. 1981 - Dec. 1982
Mawshyong Jack Shiau and C. Edward Lan Oct. 1983 74 p refs
(Grant NAG1-75)
(NASA-CR-172233; NAS 1.26:172233; CRINC-FRL-467-2) Avail: NTIS HC A04/MF A01 CSCL 01A

The partial differential equation for small disturbance steady rotational flow in three dimensions is solved through an integral equation approach. The solution is obtained by using the method of weighted residuals. Specific applications are directed to wings in nonuniform subsonic parallel streams with velocity varying in vertical and spanwise directions and to airfoils in nonuniform freestream. Comparison with limited known results indicates that the present method is reasonably accurate. Numerical results for the lifting pressure of airfoil, lift, induced drag, and pitching moments of airfoil, lift, induced drag, and pitching moments of elliptic, rectangular, and delta wings in a jet, wake, or monotonic sheared stream are presented. It is shown that, in addition to the effect of local dynamic pressures, a positive velocity gradient tends to enhance the lift. Author

N84-10018*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL INVESTIGATION OF A FREE-TIP ROTOR CONFIGURATION IN A FORWARD FLIGHT WIND-TUNNEL TEST
Robert H. Stroub Oct. 1983 22 p refs
(NASA-TM-84409; A-9485; NAS 1.15:84409) Avail: NTIS HC A02/MF A01 CSCL 01A

Results from an experimental evaluation of a free-tip rotor are presented. The evaluation included whirl tests and wind tunnel tests up to advance ratios of 0.4. The free tip extended over the outer 5% of the rotor blade and included a passive mechanical controller whose output characteristics were varied. The controller configuration combined with the free tip aerodynamics resulted in higher power requirements, because the tip's pitch angle was 5 to 10 degrees greater than that of the inboard portion of the blade, and its pitching motion capability was considered to be inhibited by frictional forces. Recommendations are included for design features for a follow-on test. Author

N84-10019*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUBSONIC HIGH-ANGLE-OF-ATTACK AERODYNAMIC CHARACTERISTICS OF A CONE AND CYLINDER WITH TRIANGULAR CROSS SECTIONS AND A CONE WITH A SQUARE CROSS SECTION
Mark H. Clarkson (Florida Univ., Gainesville), Gerald N. Malcolm, Victoria A. Brittain (Florida Univ., Gainesville), and Paul A. Intemann Aug. 1983 78 p refs
(NASA-TM-84377; A-9392; NAS 1.15:84377) Avail: NTIS HC A05/MF A01 CSCL 01A

Experiments were conducted in the 12-Foot Pressure Wind Tunnel at Ames Research Center on three models with noncircular cross sections: a cone having a square cross section with rounded corners and a cone and cylinder with triangular cross sections and rounded vertices. The cones were tested with both sharp and blunt noses. Surface pressures and force and moment measurements were obtained over an angle of attack range from 30 deg to 90 deg and selected oil-flow experiments were conducted to visualize surface flow patterns. Unit Reynolds numbers ranged from 0.8x1,000,000/m to 13.0x1,000,000/m at a Mach number of 0.25, except for a few low-Reynolds-number runs at a Mach number of 0.17. Pressure data, as well as force data and oil-flow photographs, reveal that the three dimensional flow structure at angles of attack up to 75 deg is very complex and is highly dependent on nose bluntness and Reynolds number. For angles of attack from 75 deg to 90 deg the sectional aerodynamic characteristics are similar to those of a two dimensional cylinder with the same cross section. Author

N84-10020*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Aeromechanics Lab.
MODEL HELICOPTER ROTOR HIGH-SPEED IMPULSIVE NOISE: MEASURED ACOUSTICS AND BLADE PRESSURES
D. A. Boxwell, F. H. Schmitz (Army Aviation Research and Development Command, Moffett Field, Calif.), W. R. Splettstoesser (DFVLR, Brunswick), and K. J. Schultz (DFVLR, Brunswick) Sep. 1983 36 p refs Presented at the 9th European Rotorcraft Forum, Stresa, Italy, 13-15 Sep.
(NASA-TM-85850; A-9463; NAS 1.15:85850; USAAVRADCOM-TR-83-A-14) Avail: NTIS HC A03/MF A01 CSCL 01A

A 1/17-scale research model of the AH-1 series helicopter main rotor was tested. Model-rotor acoustic and simultaneous blade pressure data were recorded at high speeds where full-scale helicopter high-speed impulsive noise levels are known to be dominant. Model-rotor measurements of the peak acoustic pressure levels, waveform shapes, and directively patterns are directly compared with full-scale investigations, using an equivalent in-flight technique. Model acoustic data are shown to scale remarkably well in shape and in amplitude with full-scale results. Model rotor-blade pressures are presented for rotor operating conditions both with and without shock-like discontinuities in the radiated acoustic waveform. Acoustically, both model and full-scale measurements support current evidence that above certain high subsonic advancing-tip Mach numbers, local shock waves that exist on the rotor blades "delocalize" and radiate to the acoustic far-field. Author

N84-10021*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT MEASUREMENTS OF HINGED-PLATE WING-SPOILER HINGE MOMENTS
Emmett B. Fry Sep. 1983 23 p
(NASA-TM-84343; A-9282; NAS 1.15:84343) Avail: NTIS HC A02/MF A01 CSCL 01A

Hinge moment of hinged-plate wing spoilers were measured during flight of a twin turboprop airplane modified by the addition of upper and lower wing-surface spoilers. The spoiler-actuating hydraulic cylinders were instrumented to measure the forces required to extend the spoiler panels. Those measurements were converted to moment coefficient form, and are presented as a function of spoiler deployment angle. The hinge-moment data were collected at three flight conditions: with flaps extended at approach speed; with flaps retracted at a low speed; and with flaps retracted at a high speed (C sub L = 1.4, 1.0, and 0.5). In general, the magnitude of measured spoiler hinge moments were lower than predicted. Furthermore, for upper surface spoilers with flaps extended, the hinge moments increased in a discontinuous manner between spoiler deflection <10 and >10. A.R.H.

N84-10022*# Massachusetts Inst. of Tech., Cambridge.
EIGENMODE ANALYSIS OF UNSTEADY ONE-DIMENSIONAL EULER EQUATIONS Final Report
Michael Giles Aug. 1983 19 p refs
(Contract NAS1-17130; Grant NAG3-9)
(NASA-CR-172217; NAS 1.26:172217; Rept-83-47) Avail: NTIS HC A02/MF A01 CSCL 01A

The initial boundary value problem describing the evolution of unsteady linearized perturbations of a steady, uniform subsonic flow is analyzed. The eigenmodes and eigenfrequencies of the system are derived and several examples are presented to illustrate the effect of different boundary conditions on the exponential decay rate of the eigenmodes. The resultant implications for the stability and convergence rates of finite difference computations are discussed. Author

N84-10023# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
NUMERICAL ANALYSIS OF DUSTY SUPERSONIC FLOW PAST BLUNT AXISYMMETRIC BODIES
H. Sugiyama Aug. 1983 78 p refs

(UTIAS-267; ISSN-0082-5255) Avail: NTIS HC A05/MF A01

An inverse method was developed for treating gas-particle supersonic flow past axisymmetric blunt bodies. The pure gas flow fields around spheres were first solved numerically for the freestream Mach numbers M sub infinity = 10, 6, 4, 3, 2, and 1.50. These were found to be in very good agreement with the available results of Van Dyke and Gordon. Then the gas-solid-particle flow in the shock layer around blunt bodies (nearly spheres) were solved for the freestream Mach numbers M sub infinity = 10 and 1.5, with freestream loading ratios alpha = 0, 0.2, 0.5, and 1.0 and particle diameters bar d sub p = 1, 2, 5 and 10 microns, respectively. The effects of M sub infinity, bar a sub p and alpha on the shock-layer thickness and the body surface pressures are discussed. The variations of the flow properties along the stagnation and adjacent streamlines are also shown in some detail. N.W.

N84-10024*# General Dynamics Corp., Fort Worth, Tex.

DEVELOPMENT OF V/STOL METHODOLOGY BASED ON A HIGHER ORDER PANEL METHOD Contract Report, Mar. 1982 - Mar. 1983

I. C. Bhateley, G. A. Howell, and H. W. Mann Jun. 1983 329 p refs

(Contract NAS2-11167)

(NASA-CR-166491; NAS 1.26:166491) Avail: NTIS HC A15/MF A01 CSCL 01A

The development of a computational technique to predict the complex flowfields of V/STOL aircraft was initiated in which a number of modules and a potential flow aerodynamic code were combined in a comprehensive computer program. The modules were developed in a building-block approach to assist the user in preparing the geometric input and to compute parameters needed to simulate certain flow phenomena that cannot be handled directly within a potential flow code. The PAN AIR aerodynamic code, which is higher order panel method, forms the nucleus of this program. PAN AIR's extensive capability for allowing generalized boundary conditions allows the modules to interact with the aerodynamic code through the input and output files, thereby requiring no changes to the basic code and easy replacement of updated modules. Author

N84-10025*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EFFECT OF THRUST VECTORING AND WING MANEUVER DEVICES ON TRANSONIC AEROPROPULSIVE CHARACTERISTICS OF A SUPERSONIC FIGHTER

Francis J. Capone and David E. Reubush Feb. 1983 88 p refs

(NASA-TP-2119; L-15526; NAS 1.60:2119) Avail: NTIS HC A05/MF A01 CSCL 01A

The aeropropulsive characteristics of an advanced fighter designed for supersonic cruise were determined in the Langley 16-Foot Transonic Tunnel. The objectives of this investigation were to evaluate the interactive effects of thrust vectoring and wing maneuver devices on lift and drag and to determine trim characteristics. The wing maneuver devices consisted of a drooped leading edge and a trailing-edge flap. Thrust vectoring was accomplished with two dimensional (nonaxisymmetric) convergent-divergent nozzles located below the wing in two single-engine podded nacelles. A canard was utilized for trim. Thrust vector angles of 0 deg, 15 deg, and 30 deg were tested in combination with a drooped wing leading edge and with wing trailing-edge flap deflections up to 30 deg. This investigation was conducted at Mach numbers from 0.60 to 1.20, at angles of attack from 0 deg to 20 deg, and at nozzle pressure ratios from about 1 (jet off) to 10. Reynolds number based on mean aerodynamic chord varied from 9.24 x 10 to the 6th to 10.56 x 10 to the 6th. Author

N84-10026# Air Force Academy, Colo.

EXPERIMENTAL MEASUREMENTS OF WAKE CHARACTERISTICS OF LOW ASPECT-RATIO DELTA AND FLAPPED-PLATE PLANFORMS Technical Note, 1 Jan. - 1 Jun. 1982

C. R. Kedzie and K. E. Griffin 15 Mar. 1983 44 p refs

(AD-A130398; USAFA-TN-83-6) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report documents the characteristics and location of the wakes for two generic lifting surface planforms. The geometric description locates these wakes as they develop downstream from a low aspect-ratio delta wing and a bent-plate wing. The wakes are graphically depicted at several streamwise locations downstream of these wings with accompanying cross-velocity vector plots to assist in interpreting them. The data used to determine these wake characteristics was obtained by surveying the wings' flow field with a seven-hole pressure probe. Author (GRA)

N84-10027# Ballistic Research Labs., Aberdeen Proving Ground, Md.

NUMERICAL COMPUTATION OF BASE FLOW FOR A PROJECTILE AT TRANSONIC SPEEDS Final Report

Jubaraj Sahu, Charles J. Nietubicz, and Joseph L. Steger Jun. 1983 33 p refs

(DA Proj. 1L1-61102-AH-43)

(AD-A130293; AD-F300274; ARBRL-TR-02495) Avail: NTIS HC A03/MF A01 CSCL 19/4

The generalized-Axisymmetric Thin-Layer Navier-Stokes computational technique has been modified for projectile base flow analysis. The resulting new numerical capability is used to compute the entire projectile flow field including the recirculatory base flow. Computed results show the qualitative and quantitative details of the overall base flow structure. Base drag is computed for a secant-ogive-cylinder projectile at an angle of attack of zero and compared with available experimental data and a semi-empirical analysis. Results are also presented which show pressure drag, skin friction drag and total aerodynamic drag for Mach No. $.9 < M < 1.2$. Author (GRA)

N84-10028# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.

AEROELASTIC RESPONSE OF AN AIRCRAFT WING TO RANDOM LOADS

B. H. K. Lee Apr. 1983 60 p refs

(AD-A130476; NRC-21230; NAE-LR-613) Avail: NTIS HC A04/MF A01 CSCL 20/4

A method for the prediction of the response of an elastic wing to random loads at flight conditions using rigid model wind tunnel pressure fluctuation measurements is presented. The wing is divided into panels or elements, and the load is computed from measured pressure fluctuations at the center of each panel. A series representation with terms of the correlated noise type is used to curve fit the experimentally determined pressure power spectra. Two methods are used to calculate the random load spectrum: a constant correlation approximation, and an exponential spatially decaying cross-power spectrum model for the pressure. The coupling between the structural dynamics and aerodynamics of a vibrating wing is taken into consideration using the doublet-lattice method for computing the unsteady aerodynamic forces. The acceleration and displacement response spectra have been computed for the F-4E aircraft for various Mach numbers, dynamic pressures and flight altitudes. The importance of the unsteady aerodynamic loads induced by the vibration of the wing and input load representation is illustrated by comparing the theoretical predictions with results from flight tests. Author (GRA)

N84-10029# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.

A NEW METHOD OF ESTIMATING WIND TUNNEL WALL INTERFERENCE IN THE UNSTEADY TWO-DIMENSIONAL FLOW

H. Sawada (National Aerospace Lab., Japan) Jan. 1983 61 p refs

(AD-A130475; NRC-21274; NAE-AN-9) Avail: NTIS HC A04/MF A01 CSCL 20/4

A new method of estimating wall interference in unsteady flow is presented. This method is valid for subcritical flow within the accuracy of the linearized small disturbance theory. The main feature of the method is the use of measured pressure along lines in the flow direction near the tunnel walls. This method is

particularly effective in a tunnel with ventilated walls because it does not require the representation of wall characteristics with unreliable mathematical expressions. Results of some numerical examples indicate that the new method produces satisfactory results except for cases when the reduced frequencies are close to the tunnel resonance frequencies. For the case of an airfoil in pitching motion, the method has been used to correct the amplitude of the angle attack and the time lag in the motion. Author (GRA)

N84-10030# Boeing Vertol Co., Philadelphia, Pa.
A STUDY OF THE AERODYNAMIC INTERACTIONS OF THE TAIL ROTOR AND FIN Final Report, 17 Jul. 1978 - 1 Feb. 1983
Philip F. Sheridan, Edward J. Hanker, Jr., and Bruce B. Blake 6 Jun. 1983 74 p refs
(Contract DAAG29-78-C-0021)
(AD-A130757; ARO-15710.2-EG) Avail: NTIS HC A04/MF A01 CSCL 20/4

The results of a wind tunnel investigation of the aerodynamic interaction of the tail rotor and fin are presented. Model loads data were measured for a 1/4.85 scale model of the YUH-61A. Tests were conducted deep in ground effect at wind speeds ranging from 0 to 45 knots; representative of Nap-of-the-Earth. Flow visualization studies provided additional insight into the flow mechanisms at work such as the ground vortex. Distributional flow characteristics, particularly the location and structure of the main rotor tip vortex, were measured by a hot film probe. A variable fin incidence mechanism was incorporated in the model to measure the integrated flow at the empennage. Adverse fin force and tail rotor power variations are measured as functions of airspeed, wind azimuth, tail rotor thrust and main rotor thrust. Author (GRA)

N84-10031# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Computational Aerodynamics Group.
INTRODUCTION TO COMPUTATIONAL AERODYNAMICS Final Report, 5 Jan. - 3 Jul. 1981
Wilbur L. Hankey Apr. 1983 125 p refs
(AF Proj. 2307)
(AD-A130717; AFWAL-TR-82-3031) Avail: NTIS HC A06/MF A01 CSCL 20/4

During the last decade remarkable advances have occurred in our ability to solve the Navier-Stokes equations for complex flows. Algorithms were developed and the speed and capacity of digital computers evolved to permit these advances. This report traces some of the significant features of this new field of Computational Fluid Dynamics (CFD). The objective is to provide an introduction to CFD for engineers starting in the field. The governing equations are first derived in the divergence form currently in use. The use of numerical methods is first demonstrated by solving the boundary layer equations. Stability and accuracy are then discussed. Several popular algorithms for solving partial differential equations by finite difference are presented. The shock wave structure is then solved by means of one of these algorithms. Numerical techniques for grid generation are discussed along with the general transformation procedure. Self-excited fluid dynamic oscillations encountered in CFD are addressed. It is hoped that by studying these specific topics an engineer can become functional in the field of CFD. GRA

N84-10032*# Lockheed-Georgia Co., Marietta.
LANN (LOCKHEED, AFWAL, NASA-LANGLEY AND NLR) WING TEST PROGRAM: ACQUISITION AND APPLICATION OF UNSTEADY TRANSONIC DATA FOR EVALUATION OF THREE-DIMENSIONAL COMPUTATIONAL METHODS Final Report, May 1980 - Feb. 1983
J. B. Malone and S. Y. Ruo Wright-Patterson AFB, Ohio AFWAL Feb. 1983 138 p refs Sponsored in part by NASA-Langley
(Contract F33615-80-C-3213; AF Proj. 2401)
(NASA-CR-174466; NAS 1.26:174466; AD-A130701; AFWAL-TR-83-3006; LG83ER0075) Avail: NTIS HC A07/MF A01 CSCL 20/4

This report describes the LANN (Lockheed, AFWAL, NASA-Langley, and NLR) wind tunnel test program. The objective of this program was to acquire a comprehensive experimental data base on a modern, transport type wing in steady and unsteady transonic flow. Details of the model geometry and structural properties are documented. Initial correlations of portions of this data base with numerical results generated by two state-of-the-art computational aerodynamics computer programs are presented. Author (GRA)

N84-10033# Pacific Northwest Lab., Richland, Wash.
STATUS OF WIND-TURBINE WAKES RESEARCH IN THE FEDERAL WIND ENERGY PROGRAM
D. L. Hadley and D. S. Renne May 1983 22 p refs Presented at the Am. Solar Energy Soc. Meeting, Minneapolis, 1-3 Jun 1983
(Contract DE-AC06-76RL-01830)
(DE83-013828; PNL-SA-10999; CONF-830622-16) Avail: NTIS HC A02/MF A01

The performance of operating large multimegawatt-size wind turbines was investigated. The impact of wind turbine wakes on downwind machines operating in clusters or arrays was assessed. An understanding of the instantaneous structure of a wake in the near wake region behind a large wind turbine, and of the distribution of the wake induced velocity deficits out to 10 diameters downwind of a single machine evolved. A clearer picture of the qualitative nature of the turbulence structure of the wake, and of the characteristics of the vortices induced by the tips of the rotating blade was developed. The complex terrain and resultant complex airflow over the site plays an important role in the downwind structure and reenergizing of the wake that needs to be accounted for in future experiments. The measurement program provides an adequate data base for verifying or improving upon existing numerical models of the wake phenomenon or of array performance. DOE

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-10034*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SIMULATION INVESTIGATION OF THE EFFECTS OF ENGINE- AND THRUST-RESPONSE CHARACTERISTICS ON HELICOPTER HANDLING QUALITIES
Lloyd D. Corless and Chris L. Blanken (Army Aviation Research and Development Command, Moffett Field, Calif.) Oct. 1983 23 p refs Presented at the 9th European Rotorcraft Forum, Stresa, Italy, 13-15 Sep. 1983
(NASA-TM-85489; A-9469; NAS 1.15:85489; USAAVRADCOM-TR-83-A-13) Avail: NTIS HC A02/MF A01 CSCL 01C

A multi-phase program is being conducted to study, in a generic sense and through ground simulation, the effects of engine response, rotor inertia, rpm control, excess power, and vertical damping on specific maneuvers included in nap-of-the-Earth (NOE) operations. The helicopter configuration with an rpm-governed gas-turbine engine are considered. Handling-qualities-criteria data are considered in light of aspects peculiar to rotary-wing and NOE operations. The results of three moving-based piloted simulation studies are summarized and the frequency, characteristics of the helicopter thrust response which set it apart from other VTOL types are explained. Power-system response is affected by both the engine-governor response and the level of rotor inertia. However, results indicate that with unlimited power, variations in engine response can have a significant effect on pilot rating, whereas changes in rotor inertia, in general, do not. The results also show that any pilot interaction required to maintain proper control can significantly degrade handling qualities. Data for variations in vertical damping and collective sensitivity are compared with existing handling-qualities specifications, MIL-F-

83300 and AGARD 577, and show a need for higher minimums for both damping and sensitivity for the bob-up task. Results for cases of limited power are also shown. Author

N84-10035# Federal Aviation Administration, Atlantic City, N.J.
A LABORATORY TEST FOR EVALUATING THE FIRE CONTAINMENT CHARACTERISTICS OF AIRCRAFT CLASS D CARGO COMPARTMENT LINING MATERIAL Final Report, Jul. 1982 - Mar. 1983
Louis J. Brown, Jr. and Charles R. Cole Oct. 1983 36 p refs (DOT/FAA/CT-83/44; FAA Proj. 181-350-400) Avail: NTIS HC A03/MF A01

The Federal Aviation Administration Standard 2-gallon/hour burner was adapted to measure the burn-through resistance of aircraft cargo compartment lining materials. This laboratory test can subject lining samples to the fire conditions found in full-scale class D cargo compartment tests. A 5-minute test period is of adequate duration to evaluate the performance of cargo lining materials, based on full-scale test results which showed that class D fire intensity is reduced to a smoldering state after several minutes. It was determined that the 2-gallon/hour burner test is superior to the vertical and 45 deg bunsen burner tests specified in Federal Air Regulations (FAR's) 25.853 and 25.855 for evaluating the flammability and burn-through resistance of cargo compartment lining materials. The following criteria for class D cargo compartment lining materials using the 2-gallon/hour burner test are proposed: Sample must prevent burn-through for 5 minutes, and peak temperatures at 4 inches above the upper surface of a horizontal test sample should not exceed 400 deg Fahrenheit. Based on results with this laboratory test, it is concluded that fiberglass lining materials provide sufficient protection to prevent burn-through in a class D cargo compartment fire, however, Nomex(tm) and Kevlar (tm) lining materials will not contain a class D cargo compartment fire. Author

N84-10036# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT: MIDAIR COLLISION OF NORTH AMERICAN ROCKWELL AERO COMMANDER MODEL 560E, N3827C AND CESSNA 182Q, N96402, LIVINGSTON, NEW JERSEY, NOVEMBER 20, 1982
28 Jun. 1983 29 p
(PB83-910403; NTSB/AAR-83/03) Avail: NTIS HC A03/MF A01 CSCL 01C

About 1614 e.s.t., on November 20, 1982, a North American Rockwell Aero Commander Model 560E, N3827 C, and a Cessna Model 182Q, N96402, collided in midair about 2,000 feet over Livington, New Jersey, and crashed. The weather was clear at the collision attitude, and both airplanes were operating under visual flight rules. The accident occurred in the controlled airspace of the New York Terminal Control Area. Shortly before the collision, the pilot of N3827C had advised a New York Terminal Control Area. Shortly before the collision, the pilot of N3827C had advised a New York Terminal Radar Approach Control controller of his location and altitude. There was no evidence that the pilot of N96402 had radio contact with an air traffic facility. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the pilots to exercise adequate vigilance to detect and avoid each other. Contributing to the accident was the failure of the pilot of N96402 either to keep clear of the New York Terminal Control Area or to avail himself of the traffic advisory capability of the New York Terminal Radar Approach Control. Also contributing to the accident was the failure of the controller to observe the potential conflict and to adequately convey traffic information to N3827C. Author

N84-10037*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTIMIZATION OF AIRCRAFT SEAT CUSHION FIRE BLOCKING LAYERS Final Report, Jul. 1981 - Jul. 1982
D. A. Kourtides, J. A. Parker, A. C. Ling, and W. R. Hovatter Mar. 1983 216 p refs
(Contract DTFA03-81-A-00149)
(NASA-TM-85430; NAS 1.15:85430; AD-A130144; DOT/FAA/CT-82/132) Avail: NTIS HC A10/MF A01 CSCL 01/3

This report describes work completed by the National Aeronautics and Space Administration - for the Federal Aviation Administration Technical Center. The purpose of this work was to examine the potential of fire blocking mechanisms for aircraft seat cushions in order to provide an optimized seat configuration with adequate fire protection and minimum weight. Aluminized thermally stable fabrics were found to provide adequate fire protection when used in conjunction with urethane foams, while maintaining minimum weight and cost penalty. GRA

N84-10038# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
CRASHWORTHINESS: AN ILLUSTRATED COMMENTARY ON OCCUPANT SURVIVAL IN GENERAL AVIATION ACCIDENTS
William R. Kirkham, S. Marlene Wicks, and Donald Lee Lowrey Apr. 1983 41 p
(AD-A130198; FAA-AM-83-8) Avail: NTIS HC A03/MF A01 CSCL 01/2

This report is an illustrated commentary on crash survival in general aviation aircraft. Photographs, drawings, and discussion present some basic concepts of crash forces; mechanisms of injury to occupants; and the roles of shoulder harnesses, lapbelts, and seats in attenuating crash forces. Findings in a number of accidents relate seats and restraints to the fate of the occupants. The report is designed to inform the reader of the value of good restraints in crashes of general aviation aircraft. Also it will serve to orient Federal Aviation Administration (FAA) personnel and others to a set of projection slides that may be used wholly or in part in safety presentations to pilots and aviation groups. The projection slides, duplicates of the photographs and drawings in this report, are available from the Aeromedical Education Branch of the FAA Civil Aeromedical Institute. GRA

N84-10039# General Dynamics/Fort Worth, Tex.
ADVANCED ULTRA-VIOLET (UV) AIRCRAFT FIRE DETECTION SYSTEM. VOLUME 3: GROUND SUPPORT EQUIPMENT (GSE) FOR SYSTEM CHECK-OUT Final Report, Dec. 1977 - Dec. 1981
R. J. Springer, P. H. Sheath, S. P. Robinson, and D. J. V. Smith Wright-Patterson AFB, Ohio AFWAL Aug. 1982 193 p refs
(Contract F33615-77-C-2029; AF Proj. 2348)
(AD-A130298; AFWAL-TR-82-2062-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 01/2

A portable unit is described for automatically checking out a system which uses ultraviolet radiation to detect aircraft fire hazards. The unit reads out stored data gathered during flight, checks the operational capability of the detector, and identifies faulty line replaceable units. Operating instructions are included along with a description of system design, the system method, the hardware, and the software. A.R.H.

N84-10040# National Bureau of Standards, Boulder, Colo. Environmental Sciences Group.
MULTI-SCALE ANALYSES OF METEOROLOGICAL CONDITIONS AFFECTING PAN AMERICAN WORLD AIRWAYS FLIGHT 759
F. Caracena, R. A. Maddox, J. F. W. Purdom, J. F. Weaver, and R. N. Green Jan. 1983 51 p refs
(PB83-222562; NOAA-TM-ERL-ESG-2; NOAA-83062206) Avail: NTIS HC A04/MF A01 CSCL 01B

At the time of flight 759's departure there were thunderstorms in the New Orleans area. In addition, while the plane was taxiing to the takeoff runway, personnel in the New Orleans tower issued several wind shear advisories for winds that had activated the airport's low level windshear alert warning system. The seriousness of this particular event provided the motivation for a detailed examination of the meteorological conditions at the time of the accident. The evolution of weather events immediately before and

during the crash was reconstructed so that the precise role of meteorological features could be assessed. GRA

N84-10002# Joint Publications Research Service, Arlington, Va.
MININSTER BUGAYEV PROMISES IMPROVED AEROFLOT SERVICES
B. Bugayev *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 1-2 Transl. into ENGLISH from Pravda (USSR), 21 May 1983 p 3 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

N84-10005# Joint Publications Research Service, Arlington, Va.
IMPROVED AIR SHIPMENT OF FRUIT REPORTED THIS YEAR
P. Protsenko *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 9-10 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 2 Jul. 1983 p 2 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-10041*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT AND FLIGHT TEST OF AN X-BAND PRECISION APPROACH CONCEPT FOR REMOTE-AREA ROTORCRAFT OPERATIONS
George R. Clary and John P. Chisholm (Nevada Univ., Reno) Aug. 1983 11 p refs Presented at the IEEE/AIAA 5th Digital Avionics Systems Conf., Seattle, 31 Oct. - 3 Nov. 1983
(NASA-TM-84398; A-9442; NAS 1.15:84398) Avail: NTIS HC A02/MF A01 CSCL 17G

A novel airborne radar-based precision approach concept was developed and flight tested as a part of NASA's Rotorcraft All-Weather Operations Research Program. A demonstration, transponder-based beacon landing system (BLS), incorporating state-of-the-art X-band radar technology and digital processing techniques, was built and flight tested to demonstrate the concept feasibility. The BLS airborne hardware consists of an add-on microprocessor, installed in conjunction with the aircraft weather/mapping radar, which analyzes the radar beacon receiver returns and determines range, localizer deviation, and glide slope deviation. The ground station is an inexpensive, portable unit which can be quickly deployed at a landing site. Results from the flight test program show that the BLS concept has a significant potential for providing rotorcraft with low-cost, precision, instrument approach capability in remote areas. Author

N84-10042*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT EVALUATION RESULTS FROM THE GENERAL-AVIATION ADVANCED AVIONICS SYSTEM PROGRAM
G. P. Callas, D. G. Denery, G. H. Hardy, and B. F. Nedell Aug. 1983 14 p refs Presented at the 5th IEEE/AIAA Digital Avionics Systems Conf., Seattle, Wash., 31 Oct. - 3 Nov. 1983
(NASA-TM-84397; A-9441; NAS 1.15:84397) Avail: NTIS HC A02/MF A01 CSCL 17G

A demonstration advanced avionics system (DAAS) for general-aviation aircraft was tested at NASA Ames Research Center to provide information required for the design of reliable, low-cost, advanced avionics systems which would make general-aviation operations safer and more practicable. Guest pilots flew a DAAS-equipped NASA Cessna 402-B aircraft to evaluate the usefulness of data busing, distributed microprocessors, and shared electronic displays, and to provide data on the DAAS pilot/system interface for the design of future integrated avionics systems. Evaluation results indicate that the DAAS hardware and functional capability meet the program objective. Most pilots felt that the DAAS representative of the way avionics systems would evolve and felt the added capability would improve the safety and practicability of general-aviation operations. Flight-evaluation results compiled from questionnaires are presented, the results of the debriefings are summarized. General conclusions of the flight evaluation are included. Author

N84-10043*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TIME CONTROLLED DESCENT GUIDANCE ALGORITHM FOR SIMULATION OF ADVANCED ATC SYSTEMS
Homer Q. Lee and Heinz Erzberger Aug. 1983 71 p refs
(NASA-TM-84373; A-9372; NAS 1.15:84373) Avail: NTIS HC A04/MF A01 CSCL 17G

Concepts and computer algorithms for generating time controlled four dimensional descent trajectories are described. The algorithms were implemented in the air traffic control simulator and used by experienced controllers in studies of advanced air traffic flow management procedures. A time controlled descent trajectory comprises a vector function of time, including position, altitude, and heading, that starts at the initial position of the aircraft and ends at touchdown. The trajectory provides a four dimensional reference path which will cause an aircraft tracking it to touchdown at a predetermined time with a minimum of fuel consumption. The problem of constructing such trajectories is divided into three subproblems involving synthesis of horizontal, vertical, and speed profiles. The horizontal profile is constructed as a sequence of turns and straight lines passing through a specified set of waypoints. The vertical profile consists of a sequence of level flight and constant descent angle segments defined by altitude waypoints. The speed profile is synthesized as a sequence of constant Mach number, constant indicated airspeed, and acceleration/deceleration legs. It is generated by integrating point mass differential equations of motion, which include the thrust and drag models of the aircraft. DOE

N84-10044# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MATERIALS RESEARCH FOR ADVANCED INERTIAL INSTRUMENTATION. TASK 2: GAS BEARING MATERIAL DEVELOPMENT Report, 1 Oct. 1981 - 30 Sep. 1982
D. Das and K. Kumar Dec. 1982 89 p refs
(Contract N00014-77-C-0388)
(AD-A130471; CSDL-R-1647; TRR-5) Avail: NTIS HC A05/MF A01 CSCL 17/7

Chemical vapor deposition (CVD) studies were continued with formation of additional boron coatings on beryllium. Problems encountered earlier with respect to coating thickness non-uniformity were corrected by installing a feed-through to the CVD chamber which permitted rotation of the samples during deposition. Questions pertaining gas cylinder selected for the diborane gas used during CVD, were successfully addressed through control of diborane gas concentration (by diluting it with Argon gas) and selection of an appropriate substrate temperature for deposition. Friction and wear tests performed on these recently formed coatings showed excellent wear resistance with very low friction coefficient values of the surfaces versus a diamond stylus serving as a pin. The performance against a sapphire pin, however, was quite poor with high measured values of the friction coefficient in agreement with observations reported earlier. These experiments indicated that the deposition temperature was not particularly critical in determining coating quality. Additional activities included Auger Electron Spectroscopy (AES) characterization of the surfaces that were tested for wear, and initiation of procedures for fabricating parts for evaluation after assembling into an actual gyro gas bearing configuration. Author (GRA)

N84-10045# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (MATCALS) INVESTIGATION Final Technical Report, Apr. 1982 - Apr. 1983
Eric S. Sjoberg, Trent G. Farrill, Peggy A. Cloninger, Benjamin Perry, J. P. Garmon, and P. P. Britt May 1983 155 p refs Prepared in cooperation with Auburn Univ., Alabama, and Flight Transportation Assoc., Inc., Boston, Mass.
(Contract N00039-80-C-0082)
(AD-A130309; GIT/EES-A-2550-FTR) Avail: NTIS HC A08/MF A01 CSCL 17/7

Georgia Tech investigated several areas relating to the development of the Marine Air Traffic Control and Landing System (MATCALS). Several factors relating to the specification and testing of the MATCALS Airport Surveillance Radar (ASR) were studied. These include: (1) MTI improvement factor. Models of the amplitude distributions and spectral characteristics are identified and explained in the light of specifications for an ASR system; (2) L-band versus S-band transmit frequency considerations are enumerated with emphasis on the phenomenological limitations of the MTI improvement factor; (3) Three methods of measuring a radar's minimum detectable signal level are discussed. These include direct measurement, determination of the tangential sensitivity, and noise figure measurement; and (4) Remoting of the MATCALS CCS from the ASR using a fiber optic data link was investigated. Data from the AN/TPN-22 test flight program is also presented. The statistical analysis methods are explained and effects of the multipath fence and enhanced F-4J target are explored. A preliminary conclusion from the brief analysis is that the major source of azimuth tracking error in the radar itself. GRA

N84-10046# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
OMEGA DATA BANK Technical Data Report, 1980 - 1981
Theodore Turnock Jun. 1983 33 p refs
(AD-A131089; DOT/FAA/CT-82/97) Avail: NTIS HC A03/MF A01 CSCL 05/2

The International Bank for Airborne-Omega Data continued operation at the Federal Aviation Administration Technical Center. This report, issued by the Data Bank, is based upon 355 flight data hours covering flights in the North and South Atlantic, parts of the Caribbean, Central and South America, Canada, and the North Pacific. These data were collected during the winter of 1980 through spring 1981. There were three major contributors to the Omega Data Bank during this period operating the same equipment types. Operationally usable signals corresponded quite well with Omega signal coverage prediction diagrams published by Omega Navigation System Operational Detail. Exceptions were noted from Ellesmore Island over the Artic Ocean for the Liberia, Hawaii, North Dakota, and Japan signals for the specific months and times of the data flights. During the months when the above flights were made, there were 114 solar flares (of magnitude M2 or greater), 10 were coincident with recorded flight data. Several large magnetic solar flares peaked during aircraft data recording; however, no effects were discernible on observed signal-to-noise ratio values. This report is the third in a series of periodic technical reports which provide a standardized data presentation of Omega signal coverage, as measured by production airborne-Omega navigation systems over routes of commercial interest under various signal environments (e.g., propagation problem regions, high solar activity). If an independent onboard position reference system was available and recorded, then Omega position differences are also presented. GRA

N84-10047# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Science.
A CRITIQUE OF NAVSTAR GLOBAL POSITIONING SYSTEM, USER EQUIPMENT, CONFIGURATION CONTROL FOR DOD COMMON AND NAVY UNIQUE ITEMS M.S. Thesis
Thomas D. Abrahamson and Gerard M. Mauer, Jr. Jun. 1983 102 p refs
(AD-A131234) Avail: NTIS HC A06/MF A01 CSCL 17/7

The User Equipment (UE) Global Positioning System (GPS) Configuration Control structures, procedures and information system up to March 1983 is critiqued. Our objective was to explore the existing configuration management plans in terms of documentation, with specific emphasis on the feasibility of the configuration control plans for the Navy unique and DoD common items. Our conclusion is that the GPS Configuration Control Structure is fundamentally sound. However, a major problem of integrating the various facets of configuration control management exists. To correct this deficiency, the GPS Program must now obtain interservice and intraservice written agreements of Configuration Control Responsibility to further specify and clarify each service's configuration control boundaries. Author (GRA)

N84-10048# Federal Aviation Agency, Washington, D.C. Office of Management Systems.
THE FAA (FEDERAL AVIATION ADMINISTRATION) AIR TRAFFIC ACTIVITY, FISCAL YEAR 1982
Nancy Trembley 30 Sep. 1982 222 p refs
(PB83-228460) Avail: NTIS HC A10/MF A01 CSCL 17G

This report furnishes terminal and enroute air traffic activity information of the National Airspace System. The data have been reported by the FAA-operated Airport Traffic Control Towers (ARCTs), Flight Service Stations (FSSs), Combined Station Towers (CS/Ts), International Flight Service Stations (IFSSs), and Approach Control Facilities. Author (GRA)

N84-10004# Joint Publications Research Service, Arlington, Va.
START AUTOMATED TRAFFIC CONTROL SYSTEM OPERATIONAL AT KRASNODAR
S. Omelchenko *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 7-8 refs Transl. into ENGLISH from Vozdushnyy Transport (USSR), 5 May 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-10049*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL CALCULATION OF THE TRANSONIC POTENTIAL FLOW PAST A CRANKED WING
I-Chung Chang and Michael Tauber Sep. 1983 13 p refs
(NASA-TM-84391; A-9452; NAS 1.15:84391) Avail: NTIS HC A02/MF A01 CSCL 01C

The widely transonic swept-wing code, FL022, was found to have an error in the transformed flow equation in the computational domain. The revised version of the code correctly accounted for the non-straight leading edge geometry and its effect on the pressure distribution. Author

N84-10050# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN-32 TRANSPORTATION AIRCRAFT, USSR
12 Jul. 1983 9 p Transl. into ENGLISH from Tekh. Lotnicza Astronautyczna (Poland), v. 34, no. 8, 1979 p 17-18
(AD-A131013; FTD-ID(RS)T-0853-83) Avail: NTIS HC A02/MF A01 CSCL 01/3

An-32 is the developmental version of the well known family of passenger and transportation aircraft. The basic difference, compared to earlier versions, is the use of engines with considerably greater power (about 80%). The latter makes it possible to use the aircraft while retaining proper performance in airfields situated in high mountains and in tropical climate zones. The engines are situated above the wing to protect them from dust and dirt entrained from the ground. The aerodynamic changes in the wing (use of spoilers) are to improve the performance of the aircraft in the takeoff and landing phase, and the larger stabilizing

fins (below the control surfaces) increase directional stability in the event of failure of one engine. GRA

N84-10051# Aeronautical Research Labs., Melbourne (Australia).
AIRCRAFT FATIGUE, WITH PARTICULAR EMPHASIS ON AUSTRALIAN OPERATIONS AND RESEARCH
J. Y. Mann Apr. 1983 91 p refs
(AD-A131036; ARL/STRUC-TM-361) Avail: NTIS HC A05/MF A01 CSCL 01/3

This Technical Memorandum forms the basis for the 9th Plantema Memorial Lecture to be presented by the author at the biennial meeting of the International Committee on Aeronautical Fatigue (ICAF) at Toulouse, France in May 1983. It traces the history of aircraft structural fatigue until the establishment of the Aeronautical Research Laboratories in 1939, and then deals more specifically with Australian contributions in research and development from then until the present time. These reflect both the lead-the-fleet situation for civil aircraft within Australia and the desire to operate some military aircraft for lives well in excess of their original design lives. GRA

N84-10052# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex. Industrial Hygiene Dept.
OZONE SURVEY OF C-9A Final Technical Report, Apr. - May 1982
Peter A. Lurker and Gerald D. Swoboda Jul. 1982 37 p refs
(AD-A130632; OEHL-TR-82-5) Avail: NTIS HC A03/MF A01 CSCL 01/3

The United States Air Force (USAF) uses the C-9A aircraft, which is the McDonnell Douglas DC-9, for aeromedical evacuation of patients. Based on results from previous USAF Occupational and Environmental Health Laboratory (USAF OEHL) ozone surveys of the C-141B and C-5A cargo aircraft, Headquarters Military Airlift Command requested an ozone evaluation of the C-9A. Two Columbia Scientific Industries CSI-2000 ozone meters, chemiluminescent devices that are specific for ozone, were used to measure the cabin ozone. The Federal Aviation Administration (FAA) has published a standard restricting the cabin ozone levels to no more than 0.250 ppm (sea-level corrected) ceiling concentration and to a 0.1 ppm (sea-level corrected) time-weighted average (TWA) for flight segments greater than three hours. Of concern, are the ozone levels present in the C-9A interior and whether these levels will affect patients with illness or injury that can be synergistic with ozone exposure (i.e., respiratory dysfunctions). In closing, forecasts based on TOMS maps and the synoptic meteorological features could be implemented to provide a pre-flight notification to the flight crew of a potential ozone exposure to themselves and the passengers. The ozone forecast under development can provide information on which flight levels that high ambient ozone levels will be encountered. The pilot can decide whether to fly below the ozone or around any isolated pockets. As for aeromedical evacuation, the flight crew can refer any significant ozone forecast to the medical crew for a decision on deferring the aeromedical evacuation of a patient or use of supplemental breathing oxygen. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-10053 Ohio State Univ., Columbus.
VIBRATION ANALYSIS OF TURBOMACHINERY BLADES BY SHELL THEORY Ph.D. Thesis
An-Jenq Wang 1982 193 p
Avail: Univ. Microfilms Order No. DA8305407

Alternate analytical methods are developed that are economical and well suited for parameter studies showing the effects of changing aspect ratio, thickness ratio, shallowness, pretwist, disk radius and angular velocity upon the frequencies and mode shapes. Parameter studies are essential and particularly useful in obtaining a physical understanding of the problem and in preliminary design. The Ritz method, the Reissner's variational principle, the Trefftz method, and a modified lower bound method are investigated. Special attention is given to convergence and bounds. Finally, a numerical approach was introduced to the Ritz method; curvilinear coordinate transformation and shape functions are employed to deal with the complicating factors of variable thickness, variable curvature and nonrectangular shapes of vibrating blades. Comparisons of frequencies and mode shapes between the present approach and the finite element method are made whenever possible. Dissert. Abstr.

N84-10054*# California Univ., Berkeley.
EXPERIMENTAL AND THEORETICAL STUDY OF COMBUSTION JET IGNITION Final Report
Daih-Yeou Chen, Ahmed F. Ghoniem, and Antoni K. Oppenheim Mar. 1983 138 p refs
(Grant NAG3-131; Contract W-7405-eng-48; Grant NSF CPE-81-15163)
(NASA-CR-168139; DOE/NASA/0131/1; NAS 1.26:168139) Avail: NTIS HC A07/MF A01 CSCL 21E

A combustion jet ignition system was developed to generate turbulent jets of combustion products containing free radicals and to discharge them as ignition sources into a combustible medium. In order to understand the ignition and the inflammation processes caused by combustion jets, the studies of the fluid mechanical properties of turbulent jets with and without combustion were conducted theoretically and experimentally. Experiments using a specially designed igniter, with a prechamber to build up and control the stagnation pressure upstream of the orifice, were conducted to investigate the formation processes of turbulent jets of combustion products. The penetration speed of combustion jets has been found to be constant initially and then decreases monotonically as turbulent jets of combustion products travel closer to the wall. This initial penetration speed to combustion jets is proportional to the initial stagnation pressure upstream of the orifice for the same stoichiometric mixture. Computer simulations by Chorin's Random Vortex Method implemented with the flame propagation algorithm for the theoretical model of turbulent jets with and without combustion were performed to study the turbulent jet flow field. In the formation processes of the turbulent jets, the large-scale eddy structure of turbulence, the so-called coherent structure, dominates the entrainment and mixing processes. The large-scale eddy structure of turbulent jets in this study is constructed by a series of vortex pairs, which are organized in the form of a staggered array of vortex clouds generating local recirculation flow patterns. Author

N84-10055*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIRCRAFT ELECTRIC SECONDARY POWER
Washington Jun. 1983 199 p refs Workshop held in Cleveland,

14-15 Sep. 1982
(NASA-CP-2282; E-1632; NAS 1.55:2282) Avail: NTIS HC A09/MF A01 CSCL 01C

Technologies resulted to aircraft power systems and aircraft in which all secondary power is supplied electrically are discussed. A high-voltage dc power generating system for fighter aircraft, permanent magnet motors and generators for aircraft, lightweight transformers, and the installation of electric generators on turbine engines are among the topics discussed. R.J.F.

N84-10056*# Sundstrand Corp., Rockford, Ill.
THE 400-Hz AIRCRAFT POWER-GENERATION SYSTEMS: ADVANCING THE BASELINE c33
Timothy Glennon *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 1-12 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

Today's benchmark system for the Boeing 757/767/A310 airplanes and future trends in hydromechanical aircraft power generating systems are discussed. The 757/767/A310 system represents the commercial state of the art and the direction in which Sundstrand Corp. is headed, particularly in regard to weight reduction. Sundstrand introduced microprocessor control in an in service system in the Boeing 767 and was the first to use databus communications between the controls. Plans to develop this technology are briefly discussed. Alternative ways to produce and use power in aircraft are discussed. The integrated starter drive is discussed. R.J.F.

N84-10057*# Naval Air Development Center, Warminster, Pa.
HIGH-VOLTAGE (270 V) dc POWER-GENERATING SYSTEM FOR FIGHTER AIRCRAFT c33
Kevin M. McGinley *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 13-25 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

The advantages of using high voltage, direct current advanced power generating systems in fighter aircraft are discussed. Weight reduction is achieved. Efficiency is increased 85 to 90 percent by eliminating the constant speed drive. Power interruptions are eliminated. There are no speed restrictions and no powerline constraints. Personal safety is increased by eliminating the hold on frequency, present in ac systems, which causes muscle contractions. R.J.F.

N84-10058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THREE-PHASE, HIGH-VOLTAGE, HIGH-FREQUENCY DISTRIBUTED BUS SYSTEM FOR ADVANCED AIRCRAFT c33
Robert C. Finke *In its* Aircraft Elect. Secondary Power Jun. 1983 p 27-35 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

A three phase, high voltage, high frequency distributed bus system for advanced aircraft is discussed. A system model is given. Available components are described. Recommendations are given. R.J.F.

N84-10059*# Boeing Commercial Airplane Co., Seattle, Wash.
SECONDARY ELECTRIC POWER GENERATION WITH MINIMUM ENGINE BLEED
Gordon E. Tagge *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 37-50 (For primary document see N84-10055 01-37)
Avail: NTIS HC A09/MF A01 CSCL 01C

Secondary electric power generation with minimum engine bleed is discussed. Present and future jet engine systems are compared. The role of auxiliary power units is evaluated. Details of secondary electric power generation systems with and without auxiliary power units are given. Advanced bleed systems are compared with minimum bleed systems. A cost model of ownership is given. The difference in the cost of ownership between a minimum bleed system and an advanced bleed system is given. R.J.F.

N84-10060*# Lockheed-California Co., Burbank.
PRIMARY ELECTRIC POWER GENERATION SYSTEMS FOR ADVANCED-TECHNOLOGY ENGINES
Michael J. Cronin *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 51-72 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 21E

The advantages of the all electric airplane are discussed. In the all electric airplane the generator is the sole source of electric power; it powers the primary and secondary flight controls, the environmentals, and the landing gear. Five candidates for all electric power systems are discussed and compared. Cost benefits of the all electric airplane are discussed. R.J.F.

N84-10061*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
INSTALLATION OF ELECTRIC GENERATORS ON TURBINE ENGINES
Herbert F. Demel *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 73-78 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 21E

The installation of generators on turbine aircraft is discussed. Emphasis is placed on the use of the samarium cobalt generator. Potential advantages of an electric secondary power system at the engine level are listed. The integrated generator and the externally mounted generator are discussed. It is concluded that the integrated generator is best used in turbojet and low bypass ratio engines where there is no easy way of placing generators externally without influencing frontal areas. R.J.F.

N84-10062*# AiResearch Mfg. Co., Torrance, Calif.
PERMANENT-MAGNET MOTORS AND GENERATORS FOR AIRCRAFT
E. F. Echolds *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 79-91 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 21E

Electric motors and generators that use permarotating machinery, but aspects of control and power conditioning are also considered. The discussion is structured around three basic areas: rotating machine design considerations presents various configuration and material options, generator applications provides insight into utilization areas and shows actual hardware and test results, and motor applications provides the same type of information for drive systems. R.J.F.

N84-10063*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF ADVANCED MATERIALS TO ROTATING MACHINES
James E. Triner *In its* Aircraft Elect. Secondary Power Jun. 1983 p 93-101 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 21E

In discussing the application of advanced materials to rotating machinery, the following topics are covered: the torque speed characteristics of ac and dc machines, motor and transformer losses, the factors affecting core loss in motors, advanced magnetic materials and conductors, and design tradeoffs for samarium cobalt motors. B.W.

N84-10064*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERCALATED GRAPHITE ELECTRICAL CONDUCTORS c33
Bruce A. Banks *In its* Aircraft Elect. Secondary Power Jun. 1983 p 103-122 refs (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

For years NASA has wanted to reduce the weight of spacecraft and aircraft. Experiments are conducted to find a lightweight synthetic metal to replace copper. The subject of this paper, intercalated graphite, is such a material. Intercalated graphite is made by heating petroleum or coal to remove the hydrogen and to form more covalent bonds, thus increasing the molecular weight.

The coal or petroleum eventually turns to pitch, which can then be drawn into a fiber. With continued heating the pitch-based fiber releases hydrogen and forms a carbon fiber. The carbon fiber, if heated sufficiently, becomes more organized in parallel layers of hexagonally arranged carbon atoms in the form of graphite. A conductor of intercalated graphite is potentially useful for spacecraft or aircraft applications because of its low weight. B.W.

N84-10065*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW DEVELOPMENTS IN POWER SEMICONDUCTORS c33
Gale R. Sundberg *In its* Aircraft Elect. Secondary Power Jun. 1983 p 123-141 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

This paper represents an overview of some recent power semiconductor developments and spotlights new technologies that may have significant impact for aircraft electric secondary power. Primary emphasis will be on NASA-Lewis-supported developments in transistors, diodes, a new family of semiconductors, and solid-state remote power controllers. Several semiconductor companies that are moving into the power arena with devices rated at 400 V and 50 A and above are listed, with a brief look at a few devices. Author

N84-10066*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIGHTWEIGHT, HIGH-FREQUENCY TRANSFORMERS c33
Gene E. Schwarze *In its* Aircraft Elect. Secondary Power Jun. 1983 p 143-147 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

The 25-kVA space transformer was developed under contract by Thermal Technology Laboratory, Buffalo, N. Y. The NASA Lewis transformer technology program attempted to develop the baseline technology. For the 25-kVA transformer the input voltage was chosen as 200 V, the output voltage as 1500 V, the input voltage waveform as square wave, the duty cycle as continuous, the frequency range (within certain constraints) as 10 to 40 kHz, the operating temperatures as 85 deg. and 130 C, the baseplate temperature as 50 C, the equivalent leakage inductance as less than 10 micro-h, the operating environment as space, and the life expectancy as 10 years. Such a transformer can also be used for aircraft, ship and terrestrial applications. B.W.

N84-10067*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-CURRENT, HIGH-FREQUENCY CAPACITORS c33
David D. Renz *In its* Aircraft Elect. Secondary Power Jun. 1983 p 149-158 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

The NASA Lewis high-current, high-frequency capacitor development program was conducted under a contract with Maxwell Laboratories, Inc., San Diego, California. The program was started to develop power components for space power systems. One of the components lacking was a high-power, high-frequency capacitor. Some of the technology developed in this program may be directly usable in an all-electric airplane. The materials used in the capacitor included the following: the film is polypropylene, the impregnant is monoisopropyl biphenyl, the conductive epoxy is Emerson and Cuming Stycast 2850 KT, the foil is aluminum, the case is stainless steel (304), and the electrode is a modified copper-ceramic. Author

N84-10068*# Westinghouse Electric Corp., Lima, Ohio.
DC-LINK APPROACH TO CONSTANT-FREQUENCY AIRCRAFT POWER c33
Daniel S. Yorksi *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 159-172 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

This paper discusses a hybrid high-power aircraft electrical system that has very difficult and complex operating requirements. Many issues raised in selecting an approach for this application are similar to those that must eventually be addressed for a large all-electric aircraft. The requirements for this specific system are reviewed, a solution for those requirements is proposed, and some explanation is provided for the choice. Because the system requires a substantial amount of 400-Hz power, a dc-link system was selected to provide that power. Author

N84-10069*# General Electric Co., Binghamton, N.Y.
CYCLOCONVERTER ON THE ALL-ELECTRIC AIRPLANE c33
Robert C. Webb *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 173-188 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

This paper discusses the application of a cycloconverter to a permanent magnet generator. Recent developments, advanced concepts, and advanced technology systems will be covered. Recent developments include permanent magnets, permanent magnet motors and generators, and power semiconductors. Author

N84-10070*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALL-PURPOSE BIDIRECTIONAL FOUR-QUADRANT CONTROLLER
Irving G. Hansen *In its* Aircraft Elect. Secondary Power Jun. 1983 p 189-196 refs (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 21E

The basic purpose of this paper is to provide some information regarding bidirectional four quadrant resonant power conversion and describe possible applications to aircraft electrical systems. As this technology has been developed sufficiently to demonstrate its feasibility, this is an appropriate time to evaluate the benefits of its application to aircraft electrical systems. Author

N84-10071# California Inst. of Tech., Pasadena. Dept. of Engineering and Applied Science.
LINEAR THEORY OF PRESSURE OSCILLATIONS IN LIQUID FUELED RAMJET ENGINES Interim Report
F. E. C. Culick and V. Yang 1983 9 p refs
(Grant AF-AFOSR-0600-83; AF Proj. 2308)
(AD-A130882; AFOSR-83-0600TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

Low frequency pressure oscillations in ramjet engines are treated within the one dimensional approximation. The engine is treated in two parts: the inlet-section, containing relatively high speed flow, and the combustion chamber. A linearized analysis of a normal shock exposed to acoustic waves provides the upstream boundary condition. Most of the work reported was concerned with the combustion chamber. A simple model of the steady flow in a dump combustor has been worked out, comprising three regions: the flow of unburnt reactions; the region containing products of combustion; and the recirculation zone. Combustion is assumed to occur in an infinitesimally thin sheet; an infinitesimally thin shear layer separates the recirculation zone from the remainder of the flow field. Acoustic fields in the inlet and the combustion chamber are formed separately and joined at the dump plane to provide a transcendental equation for the computer wave number. Results for the frequencies of oscillations and the pressure distributions compare well with experimental data taken at the Naval Weapons Center, China Lake. Some preliminary results are given for the unsteady behavior of a normal shock wave in a diffuser, calculated with a modified form of a computer program obtained from AFRPL. GRA

N84-10072# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
THE CEMS (COMPREHENSIVE ENGINE MANAGEMENT SYSTEM) IV OAP (OIL ANALYSIS PROGRAM) ALGORITHM
H. J. Larson and T. Jayachandran May 1983 30 p refs
(AD-A131055; NPS55-83-013) Avail: NTIS HC A03/MF A01 CSCL 12/11

The Comprehensive Engine Management System (CEMS)

Phase 4, will provide real time data analysis capability for all Air Force oil analysis laboratories. This paper describes the statistical algorithm used by this system to aid the oil analysis technician in making his recommendations. The algorithms incorporates usage and oil consumption variables, and employs least squares to minimize the effects of the random errors in the spectrometer readings. Author (GRA)

N84-10073# Iowa State Univ. of Science and Technology, Ames. Turbomachinery Components Research Program.
AERODYNAMICS OF ADVANCED AXIAL-FLOW TURBOMACHINERY Final Report, 1 Oct. 1980 - 30 Nov. 1982
George K. Serovy, Patrick Kavanagh, and T. H. Okiishi Feb. 1983 73 p refs
(AF Proj. 2307)
(AD-A131360; TCRL-23; AFOSR-81-0004TR) Avail: NTIS HC A04/MF A01 CSCL 21/5

A multi-task research program on the aerodynamics of advanced axial-flow turbomachinery was completed at Iowa State University. Program components were intended to result in direct contributions to the improvement of axial-flow fan, compressor, and turbine design procedures. A detailed experimental investigation of intrapassage flow in a large-scale, curved, rectangular cross-section channel representative of turbomachinery passages was carried out. The use of stator geometry modification to improve stage performance through better secondary flow control was investigated via laboratory tests of baseline and modified version of a two-stage compressor. Aerodynamic variables which influence surface boundary layer development in compressor and turbine airfoil cascades were restudied in order to determine sources of differences between linear cascade performance and performance of equivalent cascade geometries in multistage turbomachine blade rows. GRA

N84-10074# Battelle Columbus Labs., Ohio.
TURBINE ENGINE EXHAUST HYDROCARBON ANALYSIS, TASKS 1 AND 2 Interim Report, Jan. - Sep. 1982
D. A. Berry, M. W. Holdren, T. F. Lyon, R. M. Riggin, and C. W. Spicer Tyndall AFB, Fla. AFESC Jun. 1983 83 p refs
(Contract F08635-82-C-0131; AF Proj. 1900)
(AD-A131522; AFESC/ESL-TR-82-43) Avail: NTIS HC A05/MF A01 CSCL 21/2

The environmental impact of organic compounds emitted from jet aircraft turbine engines has not been firmly established, due to the lack of data regarding the emission rates and identities of the compounds. The objective was to identify and quantify the organic compounds present in gaseous emissions from jet engines and to study the photochemical behavior of these compounds. This interim report describes the experimental work performed for Task 1 (sampling and analysis method validation) and Task 2 (combustor rig testing), wherein a variety of sensitive and reliable methods were developed and evaluated for the determination of the wide range of compounds likely to be emitted from jet engines. Tasks 3-5 will be performed between April and September, 1983. At that time emissions from full-scale jet engines can be characterized in terms of chemical composition and photochemical reactivity using a variety of fuels and operating conditions. GRA

N84-10075# California Inst. of Tech., Pasadena. Dept. of Engineering and Applied Science.
LINEAR THEORY OF PRESSURE OSCILLATIONS IN LIQUID-FUELED RAMJET ENGINES Interim Report
V. Yang and F. E. C. Culick Jan. 1983 16 p refs Presented at the 21st Meeting of the AIAA Aerospace Sci., Reno, Nev., 10-13 Jan. 1983
(Grant AF-AFOSR-0265-80; AF Proj. 2308)
(AD-A131610; AFOSR-83-0649TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

Pressure oscillations in ramjet engines are studied within quasi-one dimensional linear acoustics. The flow field in the dump combustor is approximated by division into three parts: a flow of reactants, a region containing combustion products, and a recirculation zone, separated by a flame sheet and a dividing streamline. The three zones are matched by considering kinematic and conservative relations. Acoustic fields in the inlet section and in the combustion chamber are coupled to provide an analytical equation for the complex wave number characterizing the linear stability. GRA

N84-10076# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
X-RAY WEAR METAL MONITOR Final Report, Dec. 1981 - Dec. 1982
Leonard L. Packer Wright-Patterson AFB, Ohio AFWAL May 1983 42 p refs
(Contract F33615-81-C-2065; AF Proj. 3048)
(AD-A131251; AFWAL-TR-83-2029; PWA/GPD-FR-16823) Avail: NTIS HC A03/MF A01 CSCL 21/5

The objective of this program was a laboratory investigation to study and define the operating parameters and basic equipment requirements of an X-ray fluorescence wear metal monitor system. Specifically, the work has defined the controlling factors of the wear metal detection sensitivity for iron, copper, silver and titanium. The safety and regulatory requirements involved in the use of radioactive materials were also examined. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-10077 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A DYNAMIC MODEL FOR AIRCRAFT POSTSTALL DEPARTURE Ph.D. Thesis
Mark Andrew Hreha 1982 134 p
Avail: Univ. Microfilms Order No. DA8304113

An engineering model designed for the analysis of high angle of attack flight characteristics is developed and applied to the problem of aircraft poststall departure. The model consists of an aerodynamics package used interactively with a six degree of freedom flight simulator. The aerodynamics are computed via a nonlinear lifting line theory with unsteady wake effects due to a discrete, nonplanar vortex system. A fully configured aircraft (main wing, horizontal tail and vertical fin) is mathematically constructed by modeling all lifting surfaces with bound, discrete vortex segments and associated control points; vehicle geometric influence on high angle of attack flight characteristics is included through complete variability in the relative locations, orientations and sizes of the flight surfaces. This aircraft model is flown through prescribed maneuvers by integrating the equations of motion. Selected results of trajectory simulations presented for a typical general aviation aircraft provide the following insights to wing drop departure subsequent to stall. Dissert. Abstr.

N84-10078*# Information and Control Systems, Inc., Hampton, Va.
ATOPS B-737 INNER-LOOP CONTROL SYSTEM LINEAR MODEL CONSTRUCTION AND VERIFICATION Interim Report
John R. Broussard Feb. 1983 65 p refs
(Contract NAS1-15759)
(NASA-CR-166055; NAS 1.26:166055; TR-682101) Avail: NTIS HC A04/MF A01 CSCL 01C

Nonlinear models and block diagrams of an inner-loop control system for the ATOPS B-737 Research Aircraft are presented. Continuous time linear model representations of the nonlinear inner-loop control systems are derived. Closed-loop aircraft simulations comparing nonlinear and linear dynamic responses to step inputs are used to verify the inner-loop control system models. Author

N84-10079*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPLICATION OF AN ADAPTIVE BLADE CONTROL ALGORITHM TO A GUST ALLEVIATION SYSTEM
Shigeru Saito Sep. 1983 32 p refs
(NASA-TM-85848; A-9497; NAS 1.15:85848) Avail: NTIS HC A03/MF A01 CSCL 01C

The feasibility of an adaptive control system designed to alleviate helicopter gust induced vibration was analytically investigated for an articulated rotor system. This control system is based on discrete optimal control theory, and is composed of a set of measurements (oscillatory hub forces and moments), an identification system using a Kalman filter, a control system based on the minimization of the quadratic performance function, and a simulation system of the helicopter rotor. The gust models are step and sinusoidal vertical gusts. Control inputs are selected at the gust frequency, subharmonic frequency, and superharmonic frequency, and are superimposed on the basic collective and cyclic control inputs. The response to be reduced is selected to be that at the gust frequency because this is the dominant response compared with sub- and superharmonics. Numerical calculations show that the adaptive blade pitch control algorithm satisfactorily alleviates the hub gust response. Almost 100% reduction of the perturbation thrust response to a step gust and more than 50% reduction to a sinusoidal gust are achieved in the numerical simulations. Author

N84-10080# Rockwell International Corp., Los Angeles, Calif. Aircraft Operations Div.
AIRPLANE ACTUATION TRADE STUDY Final Report, 25 Jun. 1979 - 1 Jul. 1982
C. W. Helsley Jan. 1983 383 p refs
(Contract F33615-79-C-3615; AF Proj. 2403)
(AD-A130709; AFWAL-TR-82-3108; NA-79-492-2) Avail: NTIS HC A17/MF A01 CSCL 01/3

This report contains the results of the Airplane Actuation Trade Study Program. The study, conducted in three phases, included establishment of actuation requirements; design of two airplanes (a baseline airplane and an all-electric airplane) and a trade study of the two airplanes plus several minor variants. The trade study includes quantitive comparison data relative to weight, reliability, maintainability, and life cycle cost. The study results indicate that the All-Electric approach did not provide a viable alternative to the more conventional Hydraulic Electric approach as these approaches would be developed and applied to aircraft of the mid-1990 time period. Author (GRA)

N84-10081# Aeronautical Research Labs., Melbourne (Australia).
GUST RESPONSE OF A LIGHT, SINGLE-ENGINED, HIGH-WING AIRCRAFT
C. J. Ludowyk Jan. 1983 49 p refs
(AD-A131033; ARL/AERO-TM-345) Avail: NTIS HC A03/MF A01 CSCL 20/4

A recently developed FORTRAN program for calculating rigid-aircraft gust response has been applied to obtain longitudinal and lateral transfer functions and output response spectra for a general aviation, high wing aircraft. GRA

N84-10082# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SPECIAL COURSE ON AERODYNAMIC CHARACTERISTICS OF CONTROLS
Jul. 1983 254 p refs Course held in Rhode-Saint-Genese, Belgium, 21-25 Mar. 1983
(AGARD-R-711; ISBN-92-835-1457-2) Avail: NTIS HC A12/MF A01

The aerodynamic characteristics of aircraft control surfaces and methods for theoretical and experimental analysis of those characteristics are discussed. Direct force controls, device actuation, and unsteady and oscillatory controls are addressed. Some consideration is also given to missile controls. For individual titles, see N84-10083 through N84-10092.

N84-10083# Queen Mary Coll., London (England). Dept. of Aeronautical Engineering.
INTRODUCTORY REMARKS AND REVIEW OF 1979 SYMPOSIUM
A. D. Young *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 7 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

A brief historical review of aircraft controls is given. The impact of recent technological development, novel controls, and the status of predictive theories and experimental techniques are also addressed. M.G.

N84-10084# Thomas (H. H. B. M.), Farnborough (England).
THE AERODYNAMICS OF AIRCRAFT CONTROL: A GENERAL SURVEY IN THE CONTEXT OF ACTIVE CONTROL TECHNOLOGY
H. H. B. M. Thomas *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 40 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

The introduction of active control technology into the design of aircraft was accompanied by the use of additional control devices or motivators and an expansion in the uses to which existing motivators are put, either individually or in combination with each other or one of the novel forms of control. A general survey is made of the different properties such as maximum control powers, effectiveness generally, and to some extent the actuating moments as is an assessment of their relative importance in different contexts. The present data base available to the aircraft designer from different sources is examined in some detail with particular attention to identifying the direct and indirect effects. Particular emphasis is placed on the efficiency of the motivator at extreme flight conditions, characterized by high angle of attack and high subsonic speeds. Author

N84-10085# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. for Design-Aerodynamics.
MATHEMATICAL MODELLING AND THEORETICAL METHODS FOR THE AERODYNAMIC BEHAVIOUR OF CONTROL DEVICES
Horst Korner *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 23 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

A survey of the theoretical aerodynamic aspects of control devices is given. This is done for subsonic, transonic and supersonic attached flow; some comments on separated flow are also given. The basic flow equations are introduced and various calculation methods based on these equations are reviewed. This is followed by a comparison between theoretical and experimental results. Author

N84-10086# Queen Mary Coll., London (England). Dept. of Aeronautical Engineering.
DYNAMIC EFFECTS OF CONTROLS
G. J. Hancock *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 19 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

Some of the background concepts and methods underlying the interface of aerodynamics and dynamics are outlined. The topics discussed include: (1) qualitative descriptions of the unsteady aerodynamic characteristics associated with the movement of control surfaces (trailing edge controls, leading edge controls, spoilers) at various Mach numbers; (2) a summary of the methods of prediction of unsteady control surface aerodynamics; (3) a preliminary indication of comparisons between results from theory and experiment; (4) the concept of aerodynamic derivatives; and (5) the interface between aerodynamics and dynamics. M.G.

N84-10087# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
EXPERIMENTAL METHODS TO DETERMINE CONTROL

EFFECTIVENESS IN WIND TUNNELS
D. G. Mabey *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 18 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

The methods used to determine control effectiveness in wind tunnels are reviewed using illustrative examples. Major experimental difficulties are enumerated. The controls discussed include tailplanes, ailerons, airbrakes and spoilers. Both steady and unsteady measurements are considered, although the emphasis is on unsteady measurements and transonic speeds. As an illustration of the current interest in active control technology, some results from an experiment are included in which a trailing edge flap is driven 'closed loop' to reduce the response of a model wing to flow unsteadiness. M.G.

N84-10088*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROL OF THE FOREBODY VORTEX ORIENTATION BY ASYMMETRIC AIR INJECTION. PART A: APPLICATION TO ENHANCE DEPARTURE/SPIN RECOVERY OF FIGHTER AIRCRAFT AND PART B: DETAILS OF THE FLOW STRUCTURE
A. M. Skow (Northrop Corp., Hawthorne, Calif.) and D. J. Peake *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 22 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

A concept developed to provide powerful directional control effectiveness for a fighter aircraft at high angles of attack is described. The concept utilizes the energy concentrated in the strong forebody vortices (which form on slender bodies of high relative incidence) by controlling the lateral orientation of the vortices with respect to the body. The objective was to utilize the side force associated with asymmetric vortices, in a controlled manner, to enhance the ability of the fighter to recover from a departure from controlled flight. The results from water tunnel and wind tunnel experiments show that a small amount of tangential blowing along the forebody near the apex can effectively alter the forebody vortex system and generate large restoring yawing moments. Six degree of freedom digital simulation results show that this concept can substantially enhance recovery characteristics of fighter aircraft with long, slender forebodies. Also, the results of experiments which were conducted on a cone model are discussed where the principal test objective was to develop an understanding of the fluid mechanics involved in the process of vortex control. Knowledge gained in these more generic tests should allow the concept to be applied to a wider range of configurations. M.G.

N84-10089# Northrop Corp., Hawthorne, Calif. Aircraft Div.
CONTROL OF ADVANCED FIGHTER AIRCRAFT
A. M. Skow *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 31 p (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

An overview of traditional and projected control technologies for fighter aircraft is presented. Basic aerodynamic effectiveness and control criteria are examined and contraversies regarding tail location and angle of attack limiting are discussed. Future research directions are described including thrust vectoring, control implications of new air combat maneuvering tactics, ultra-fast actuators, and novel controls. M.G.

N84-10090# Hochschule der Bundeswehr, Munich. (West Germany).
DIRECT FORCE CONTROL
Gottfried Sachs *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 17 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

Direct force control provides novel and unique motion capabilities of the aircraft due to independent control of flight path and altitude. In addition, flight path response characteristics can be speeded up. For direct lift control, it is shown how these novel capabilities may be utilized, with a discussion of possible deficiencies of conventional elevator control added for comparison. The aerodynamic characteristics of direct lift devices are described. This concerns not only lift but also drag characteristics which may be of significance for the long term response of the aircraft (flight path stability). For direct side force control, the novel motion capabilities possible are shown. This is followed by a description of the aerodynamic force characteristics of control surfaces applicable for direct side force control. In addition, coupling effects are discussed as well as effects on stability. In regard to direct drag control, some basic aspects concerning control surfaces and deceleration levels achievable are described. Author

N84-10091# Cranfield Inst. of Tech., Bedfordshire (England). Coll. of Aeronautics.
EXPERIMENTAL METHODS IN FLIGHT FOR THE MEASUREMENT OF CONTROL CHARACTERISTICS
M. E. Eshelby *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 17 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

Although the measurement of control characteristics is relatively simple in the wind tunnel their flight measurement is not so straightforward. In general the control characteristics are implicit in the measurement of the handling qualities of the aircraft and do not appear as separately measured quantities. It is, however, possible to extract some data on control characteristics from the handling qualities trials; some methods of their assessment are considered. Principally the longitudinal control characteristics can be determined from static stability trials whereas the lateral directional control characteristics are derived from dynamic tests. Special trials in respect of aircraft flying beyond their normal limitations are discussed. Methods of handling qualities assessment are also considered since these encompass the control characteristics of the aircraft. Author

N84-10092# Nielsen Engineering and Research, Inc., Mountain View, Calif.
AERODYNAMIC CHARACTERISTICS OF MISSILE CONTROLS
Jack N. Nielsen *In* AGARD Spec. Course on Aerodyn. Characteristics of Controls Jul. 1983 53 p refs (For primary document see N84-10082 01-08)
Avail: NTIS HC A12/MF A01

Missile types and terminology are reviewed. The subjects of jet spoilers and combining controls and the airframe are considered. As the basic approach to integrating the presentation of all movable controls, the equivalent angle of attack concept is next taken up followed by detailed considerations of all movable planar and cruciform controls. These are treated from the phenomenological point of view as well as from the quantitative point of view. Methods of determining the effects of vortices on control characteristics are presented in sufficient detail to carry out calculations. Final control hinge moments and a preliminary method for their calculation at supersonic speed are discussed. Author

N84-10093# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMPUTER-AIDED DESIGN AND ANALYSIS OF DIGITAL GUIDANCE AND CONTROL SYSTEMS
Jul. 1983 137 p refs Lecture held in Stuttgart, 8-9 Sep. 1983 and in Paris, 12-13 Sep. 1983
(AGARD-LS-128; ISBN-92-835-1455-6) Avail: NTIS HC A07/MF A01

Basic concepts, theories, and computer methods involved in the design of advanced guidance and control systems are presented. Direct digital analysis and synthesis procedures are reviewed. Computer aided and graphical techniques that can be employed in preliminary design, synthesis and real time simulation are presented. A supporting bibliography is included. For individual titles, see N84-10094 through N84-10101.

N84-10094# Stanford Univ., Calif. Dept. of Electrical Engineering.
FUNDAMENTALS OF ANALYSIS FOR DIGITAL CONTROL SYSTEMS
G. F. Franklin *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 15 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

The theoretical background and practical tools for the design of a control system which is to be implemented using a computer or microprocessor are provided. The methods studied are primarily for closed loop (feedback) systems in which the dynamic response of the process being controlled is a major consideration in the design. The design methods are applicable to any type of computer (from microprocessors to large scale computers); however, the effects of small word size and slow sample rates take on a more important role when using microprocessors. Both the continuous design and digitization method and the direct digital method are covered. The advantages and disadvantages are discussed.
A.R.H.

N84-10095# Kingston Polytechnic, Kingston-Upon-Thames (England).
DESIGN ENVIRONMENTS AND THE USER INTERFACE FOR CAD OF CONTROL SYSTEMS
M. J. Denham *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 9 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

The design of a total CAD environment in which control systems design software can be embedded is considered. This environment includes a rich set of software tools for the creation, modification, simulation and analysis of dynamic system models and a powerful user interface to these tools which incorporates an interactive algorithmic design language. An analogy can be made between such a CAD environment and those which exist currently for software development, e.g., Interlisp. The features which such an environment should possess and how these might be developed are described. Particular attention is devoted to the user interface since it is now generally recognized that the quality of the man computer interface is crucial to the successful use of a CAD system. The human factors aspects of the interface are reviewed and examples of how a CAD system can be designed to take account of these aspects. The DELIGHT system from the University of California, Berkeley, is referred to as an example of a user orientated design environment. Author

N84-10096# Lund Inst. of Tech. (Sweden). Dept. of Automatic Control.
MODELING AND SIMULATION TECHNIQUES
K. J. Astroem *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 18 p refs (For pnmary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

Systematic methods for design of control systems require mathematical models of the dynamics of processes and disturbances. An overview of techniques for obtaining such models is presented. Modeling from first principles and modeling from data are discussed. Particular emphasis is given to computer aided tools for obtaining and verifying the models. Two interactive software packages: Simnon, for nonlinear simulation, and Idpac, for data analysis and identification are described. Speculation on future trends is included. Author

N84-10097# University of Southern California, Los Angeles. Dept. of Electrical Engineering Systems.
NUMERICAL ASPECTS OF CONTROL DESIGN COMPUTATIONS
Alan J. Laub *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 16 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

The interplay between recent results and methodologies in numerical linear algebra and mathematical software and their application to problems arising in systems, control, and estimation theory is discussed. The impact of finite precision, finite range arithmetic (including the implications of the proposed IEEE Floating Point Standard(s) on control design computations is illustrated with numerous examples as are pertinent remarks concerning numerical stability and conditioning. Basic tools from numerical linear algebra such as linear equations, linear least squares, eigenproblems, generalized eigenproblems, and singular value decomposition are then outlined. A selected list of applications of the basic tools follows including algorithms for solution of problems such as matrix exponentials, frequency response, system balancing, and matrix Riccati equations. The implementation of such algorithms as robust mathematical software is discussed. Characteristics of reliable mathematical software, availability and evaluation, language implications (FORTRAN, ADA, etc.), and the overall role of mathematical software as a component of computer aided control system design are among the issues addressed. A.R.H.

N84-10098# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
PERFORMANCE AND ROBUSTNESS ASPECTS OF DIGITAL CONTROL SYSTEMS
J. E. Wall, J. C. Doyle, G. L. Hartmann, N. A. Lehtomaki, and G. Stein *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 33 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

A formulation of the feedback control problem captures both the performance and robustness aspects of feedback. The structured singular value provides the solution to this problem. The problem formulation and solution are reviewed and its applicability is extended and its applicability to digital feedback control systems. A digital compensator is treated as though it were an analog compensator through the use of sectors. An integrated flight propulsion control system is used as an illustrative example. Author

N84-10099# Stanford Univ., Calif. Dept. of Electrical Engineering.
DIRECT DIGITAL DESIGN VIA POLE PLACEMENT TECHNIQUES
G. F. Franklin *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 13 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

The design of the dynamics of a digital control for satisfactory transient response can be done in a number of ways. One of the more effective ways is to do the design so that the poles of the closed loop system are in desired or at least acceptable locations. Such design schemes are known as pole placement methods. The method of pole placement is described and formulas suitable for computer implementation are given. Also, the method is compared to both transform methods and to methods based on optimal control, including stochastic control and the Kalman filter. Several examples illustrate the methods. Author

N84-10100# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
SYSTEMATIC COMPUTER AIDED CONTROL DESIGN
Georg Gruebel and Gerhard Kreisselmeier *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 7 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

Computerized synthesis techniques of modern control theory are in widespread use, but a number of fundamental design problems still remain: the design specifications problem; the free design parameter problem; the plant complexity versus controller simplicity problem; and the dirty design environment problem. A design procedure which comes close to solving these design problems is recommended. It is an iterative design technique using a performance index vector which provides a systematic guidance

for the designer to take care of multiple design objectives simultaneously and individually. As a design tool, unconstrained parameter optimization is used. A practical application is reported: the design of a robust control loop for a fighter aircraft where 42 performance criteria of 9 different sorts are considered simultaneously. Author

N84-10101# Lund Inst. of Tech. (Sweden). Dept. of Automatic Control.
PRACTICAL ASPECTS OF DIGITAL IMPLEMENTATION OF CONTROL LAWS
K. J. Astroem *In* AGARD Computer-Aided Design and Anal. of Digital Guidance and Control Systems Jul. 1983 9 p refs (For primary document see N84-10093 01-08)
Avail: NTIS HC A07/MF A01

Practical problems associated with digital computer implementation control laws are discussed. The key problem is to convert a digital control law in state space or polynomial form into a computer program which gives the desired results. The paper covers: sensor and actuator interfaces, analog prefiltering, actuator saturation, anti-windup, numerics and coding. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-10102# Dayton Univ., Ohio.
THREE-DIMENSIONAL TEST EXPERIENCE WITH A TRANSONIC ADAPTIVE-WALL WIND TUNNEL Final Report, Apr. 1981 - Dec. 1982
Donald J. Harney Wright-Patterson AFB, Ohio AFWAL Mar. 1983 86 p refs
(Contract F33615-79-C-3030; AF Proj. 2404)
(AD-A129858; AFWAL-TR-83-3028) Avail: NTIS HC A05/MF A01 CSCL 14/2

A square 9-inch wind tunnel with solid sidewalls and flexible upper and lower rod walls capable of 3-D contouring was used to test an axisymmetric and a winged lifting model at M=0.50 to 0.95. The simple, direct analytical method for wall contouring uses the model geometry for solid blockage and iterative model force data to adapt for lift and for wake blockage. Solid sidewall effects and the convergence of the adaptation scheme are evaluated. Linear and nonlinear theory for solid blockage is compared. Interesting comparisons are also made between 2-D and 3-D wall contouring. Author (GRA)

N84-10103# Battelle Columbus Labs., Ohio.
IMPROVED ACRYLIC SYSTEMS FOR RAPID RUNWAY REPAIR Final Report, Jun. - Sep. 1982
U. S. Nandi, R. G. Sinclair, P. C. Behrer, J. P. Boyer, and M. J. Snyder Tyndall AFB, Fla. Air Force Engineering and Services Center May 1983 38 p refs
(Contract F08635-82-C-0315)
(AD-A130389; AFESC/ESL-TR-82-46) Avail: NTIS HC A03/MF A01 CSCL 11/9

The objectives of this research were to achieve a basic improvement in the water compatibility of acrylic materials and to utilize lower cost acrylic materials, while maintaining the desirable characteristics of the DOMA system: rapid strength development over a full environmental range, high strength and toughness, low viscosity, minimum flammability and toxicity hazards, long shelf life, and ease of handling. The resultant HEMA resin yielded about 100-percent wet strength improvement with cost lowered to approximately $1.13 per pound from $2.17 per pound for DOMA. These improvements led to inclusion of HEMA in the Advanced Bomb Damage Repair Systems subtask of the Rapid Runway Repair Program. Author (GRA)

N84-10104# Battelle Columbus Labs., Ohio.
ULTRAVIOLET CURABLE RESIN SYSTEM FOR RAPID RUNWAY REPAIR Final Report, Mar. - Sep. 1982
J. P. Pfau, R. E. Sharpe, M. J. Snyder, R. L. Huggins, and F. A. Forster Tyndall AFB, Fla. Air Force Engineering and Services Center Apr. 1983 45 p refs
(Contract F08635-82-C-0214; AF Proj. 2673)
(AD-A130364; AFESC/ESL-TR-82-51) Avail: NTIS HC A03/MF A01 CSCL 11/9

In this exploratory program, the UV-initiated cure of small test samples (2 inches by 2 inches by 3/4 inch) of a furan resin concrete was demonstrated. However, due to the high cost of the UV initiator (diphenyliodonium hexafluoroarsenate), the amount of initiator required to obtain complete cure results in a very high-cost polymer concrete. Three approaches -reducing the amount of initiator, use of a catalyst, and use of alternate, more reactive initiators -- for reducing the cost of the UV-initiated furan concrete were investigated. None of these approaches, all of which would effectively reduce cost through reducing the amount of required initiator, yielded a completely cured furan concrete upon UV exposure. Author (GRA)

N84-10105# BDM Corp., McLean, Va.
THE EFFECTS OF WEATHER ON RAPID RUNWAY REPAIR, VOLUME 2 Final Report, 30 Jun. - 5 Nov. 1982
J. M. Whitehead, M. D. Hoffman, P. G. Potter, C. P. Neuswanger, and M. M. Wilding Tyndall AFB, Fla. Air Force Engineering and Services Lab. May 1983 317 p
(Contract F08635-80-C-0206; AF Proj. 2621)
(AD-A130350; BDM/W-82-592-TR-Vol-2; AFESC/ESL-TR-82-41-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 01/5

This technical report is divided into two volumes. Volume 1 contains the technical analysis and weather effects RRR process, while Appendix A, Weather Data, is published as Volume 2 because of its size. This report presents the results of a study to identify the effects of weather on Rapid Runway (RRR). There are two major components of the study. The first characterizes the aspects of weather affect RRR, by area for Korea, Europe, and England. Graphs present data on temperature, precipitation, visibility, wind, and humidity. The second component studies the effects of weather on the RRR process. The process is divided into activities, with associated efficiencies under various weather conditions. Values for efficiencies are developed from military and industrial data. The two components are combined with a critical path analysis of several RRR procedures. The report identifies potential solutions to some weather related problems, and makes recommendations for further study. GRA

N84-10106# Air Force Human Resources Lab., Brooks AFB, Tex.
LOW ALTITUDE SIMULATOR TRAINING: A-10 AIRCRAFT Final Technical Paper
Byron J. Pierce Jun. 1983 43 p refs
(AF Proj. 1123)
(AD-A130794; AFHRL-TP-82-43) Avail: NTIS HC A03/MF A01 CSCL 01/2

Simulator scenarios were developed to train student pilots in A-10 aircraft low level navigation (LLN) and elementary basic attack maneuvers (BAMs). The primary objective of this effort was to evaluate the effectiveness of these scenarios using the A-10 configured Advanced Simulator for Pilot Training (ASPT) as the training medium. Training effectiveness was assessed using simulator automated performance measures and instructor pilot (IP) evaluations of student aircraft performances in a transfer paradigm. There were 42 subjects in the BAM phase of the experiment and 36 subjects in the LLN phase. Simulator measures showed enhanced performance as a function of training for three of the five BAM tasks trained; LLN simulator performance data were not analyzed due to difficulty with the automated scoring procedures. Power values determined for aircraft performance

measures and inferences based on the results of similar efforts made questionable the validity of using IP performance evaluations for test purposes as was done in this experiment. Discussion is directed toward future test programs requiring assessment of pilot performances in tactical aircraft. Author (GRA)

N84-10107# Colorado State Univ., Fort Collins.
ROTATING-BOOM FACILITY FOR EVALUATION OF WIND CHARACTERISTICS APPROACHING A WIND-TURBINE BLADE
V. A. Sandborn Sep. 1982 30 p
(Contract DE-AC06-76RL-01830)
(DE83-013117; PNL-3960) Avail: NTIS HC A03/MF A01

A rotating boom apparatus has been developed to test transient anemometer measurements on rotating systems. The apparatus consists of a counter balanced helicopter blade mounted vertically at the top of a walk up scaffold. The blade is rotated by a variable speed, one half horsepower electric motor. The system is designed to operate over a range of rotation speeds, from less than 10 to approximately 100 revolutions per minute. Either hot wire or hot film anemometers can be mounted at the tip of the blade. The anemometers will sense both the normal and vertical wind components approaching the blade. Two battery powered, constant temperature anemometers can be mounted to the counterbalance side of the boom. The output of the anemometers is taken off the rotating shaft by a series of slip rings. Techniques for measuring the normal and vertical time dependent wind velocities approaching a rotating wind turbine blade are also evaluating the two components of turbulence, it may be difficult to apply in the wind turbine case. DOE

N84-10003# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER SVECHNIKOV ON CIVIL AVIATION CONSTRUCTION PROJECTS
In its USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 3-6 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 21 Apr. 1983 p 2 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

N84-10006# Joint Publications Research Service, Arlington, Va.
UPGRADED YAKUTSK AIRPORT OPENS TO IL-62 SERVICE
O. Borodin *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 11-12 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 2 Jul. 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

N84-10007# Joint Publications Research Service, Arlington, Va.
UZBEK SSR CITY OF SHAKHRISABZ OPENS NEW AIRPORT: TOURISM PLANNED
Sh. Zaynutdinov *In its* USSR Rept.: Transportation, No. 126 (JPRS-84457) 3 Oct. 1983 p 13 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 5 Jul. 1983 p 1 (For primary document see N84-10001 01-01)
Avail: NTIS HC A05

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-10108# Committee on Science and Technology (U. S. House).
SPACE COMMERCIALIZATION
Washington GPO 1983 388 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 23, 34, 17, 18 May 1983
(GPO-22-870) Avail: Subcommittee on Space Science and Applications

The development of opportunities for the American free enterprise system to use space for a variety of applications and technologies is discussed in an effort to assure that the private sector is free to organize and operate for profit in the space environment. The requirements of a policy framework conductive to business ventures based on space technologies are discussed as well as the relationships between the public and private sectors in the commercial utilization of space. A.R.H.

N84-10109*# TRW, Inc., Redondo Beach, Calif.
APPARATUS ANALYSIS AND PRELIMINARY DESIGN OF LOW GRAVITY POROUS SOLIDS EXPERIMENT FOR STS ORBITER MID-DECK Final Report, Dec. 1981 - Oct. 1983
R. D. Fleeter and J. L. Kropp Oct. 1983 258 p refs
(Contract NAS3-23254)
(NASA-CR-168248; NAS 1.26:168248; TRW-38884-6001-UT-00)
Avail: NTIS HC A12/MF A01 CSCL 22A

The apparatus analysis laboratory equipment design and fabrication and the preliminary design of the Combustion of Porous Solids Experiment for operation in the mid-deck area of the Shuttle are described. The apparatus analysis indicated that the mid-deck region of the STS was a feasible region of the Shuttle for operation. A sixteen tube concept was developed with tubes of 75 cm length and up to 5.6 cm accommodated. The experiment is viewed by IR sensors and a 16 mm camera. Laboratory equipment was designed and fabricated to test the parible injection, mixing and venting concepts. This equipment was delivered to NASA/LeRC. A preliminary design was made for the experiment based upon the apparatus analysis. The design incorporated results from the Phase "O" Safety Review. This design utilizes a closed tube concept in which the particles are stored, injected and burned with no coupling to the Shuttle environment. Drawings of the major components and an assembly are given. The electronics are described for the experiment. An equipment list is presented and an experiment weight estimate is determined. The mission operation requirements are outlined. Author

N84-10110# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
FOURTH OUTER SPACE PROGRAM OF THE GERMAN FEDERAL REPUBLIC [4. WELTRAUMPROGRAMM DER BUNDESREPUBLIK DEUTSCHLAND]
[1982] 82 p In GERMAN
(ISBN-3-88135-111-6) Avail: NTIS HC A05/MF A01

International cooperation in aerospace technology and outer space sources were discussed. Topics discussed include: the German space program; international cooperation; perspectives on space science and technology; trouble shooting; financing programs; astronomy and astrophysics; solar terrestrial interactions; geophysics and climatology; biological research in space; physical and chemical space research; application of space technology; communication satellites; SEASAT satellites; navigation satellites; application for Earth surveys and meteorology; experiments in space; space transportation; the Ariane booster rocket.
Transl. by E.A.K.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-10111# Range Commanders Council, White Sands Missile Range, N. Mex. Inter-Range Operations Group.

JOINT OPERATING PROCEDURE FOR INTERRANGE SCHEDULING
Jun. 1983 12 p
(AD-A130680; RCC/IOG-550-83) Avail: NTIS HC A02/MF A01 CSCL 05/1

Policies and procedures necessary to accomplish the orderly interrange scheduling of operations support services involving two or more major ranges and test facilities are defined. Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-10112*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING APPLICATIONS ROCKET (SPAR) PROJECT SPAR 7 Final Report
Richard M. Poorman Oct. 1983 120 p refs
(NASA-TM-82535; NAS 1.15:82535) Avail: NTIS HC A06/MF A01 CSCL 22B

The postflight reports of each of the Principal Investigators of three selected science payloads are presented in addition to the engineering report as documented by the Marshall Space Flight Center (MSFC). Pertinent portions of ground-based research leading to the ultimate selection of the flight sample composition are described including design, fabrication and testing. Containerless processing technology, containerless processing bubble dynamics, and comparative alloy solidification are the experiments discussed. A.R.H.

N84-10113# Pittsburgh Univ., Pa. Dept. of Electrical Engineering.
OPTICAL PATTERN RECOGNITION FOR MISSILE GUIDANCE Interim Report, Sep. 1981 - Oct. 1982
David Casasent 15 Nov. 1982 108 p refs
(Grant AF-AFOSR-0091-79; AF Proj. 2305)
(AD-A130097; AFOSR-83-0556TR) Avail: NTIS HC A06/MF A01 CSCL 17/7

Progress on real-time spatial light modulators, image pattern recognition and optical signal processing for missile guidance is documented. A full description of our test and evaluation of the Soviet PRIZ spatial light modulator is included. In image pattern recognition, a unified formulation of four different and new types of synthetic discriminant functions is advanced. These include synthetic discriminant functions for intra and inter-class pattern recognition and multi-class pattern recognition. In the area of image pattern recognition, we also advance new statistical synthetic discriminant function filter concepts and a new principal component synthetic discriminant function. These analyses utilize new performance measures and new image models. Conventional holographic pattern recognition research conducted under AFOSR support is also reviewed. Our new AFOSR optical signal processing research concerns optical matrix-vector processors. Initial research in this area includes fabrication of a fiber-optic microprocessor-based iterative optical processor and its use in adaptive phased array radar processing and for the calculation of eigenvalues and eigenvectors of a matrix. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-10114*# McDonnell-Douglas Technical Services Co., Inc., Huntsville, Ala.
A DEFINITION OF STS ACCOMMODATIONS FOR ATTACHED PAYLOADS
F. L. Echols and P. A. Broome Sep. 1983 125 p refs
(Contract NAS8-32350)
(NASA-CR-172223; NAS 1.26:172223) Avail: NTIS HC A06/MF A01 CSCL 22B

An input to a study conducted to define a set of carrier avionics for supporting large structures experiments attached to the Space Shuttle Orbiter is reported. The 'baseline' Orbier interface used in developing the avionics concept for the Space Technology Experiments Platform, STEP, which Langley Research Center has proposed for supporting experiments of this sort is defined. Primarily, flight operations capabilities and considerations and the avionics systems capabilities that are available to a payload as a 'mixed cargo' user of the Space Transportation System are addressed. Ground operations for payload integration at Kennedy Space Center, and ground operations for payload support during the mission are also discussed. Author

N84-10115*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE PERFORMANCE: LESSONS LEARNED, PART 1
James P. Arrington, comp. and Jim J. Jones, comp. Washington Oct. 1983 647 p refs Conf. held in Hampton, Va., 8-10 Mar. 1983 2 Vol.
(NASA-CP-2283-Pt-1; L-15673-Pt-1; NAS 55:2283-Pt-1) Avail: NTIS HC A99/MF A01 CSCL 22B

Beginning with the first orbital flight of the Space Shuttle, a great wealth of flight data became available to the aerospace community. These data were immediately subjected to analyses by several different groups with different viewpoints and motivations. The results were collected and presented in several papers in the subject areas of ascent and entry aerodynaics; guidance, navigation, and control; aerothermal environment prediction; thermal protection systems; and measurement techniques. For individual titles, see N84-10116 through N84-10143.

N84-10116*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PLUME BASE FLOW SIMULATION TECHNOLOGY
Barney B. Roberts, Rodney O. Wallace, and Joseph L. Sims *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 1-18 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A combined analytical/empirical approach was studied in an effort to define the plume simulation parameters for base flow. For design purposes, rocket exhaust simulation (i.e., plume simulation) is determined by wind tunnel testing. Cold gas testing was concluded to be a cost and schedule effective data base of substantial scope. The results fell short of the target, although work conducted was conclusive and advanced the state of the art. Comparisons of wind tunnel predictions with Space Transportation System (STS) flight data showed considerable differences. However, a review of the technology program data base has yielded an additional parameter that may correlate flight and cold gas test data. Data from the plume technology program and the NASA test flights are presented to substantiate the proposed simulation parameters. Author

N84-10117*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LAUNCH VEHICLE AERODYNAMIC DATA BASE DEVELOPMENT COMPARISON WITH FLIGHT DATA
J. T. Hamilton (Rockwell International), R. O. Wallace, and C. C. Dill (NASA-Marshall Space Flight Center) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 19-36 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The aerodynamic development plan for the Space Shuttle integrated vehicle had three major objectives. The first objective

was to support the evolution of the basic configuration by establishing aerodynamic impacts to various candidate configurations. The second objective was to provide continuing evaluation of the basic aerodynamic characteristics in order to bring about a mature data base. The third task was development of the element and component aerodynamic characteristics and distributed air loads data to support structural loads analyses. The complexity of the configurations rendered conventional analytic methods of little use and therefore required extensive wind tunnel testing of detailed complex models. However, the ground testing and analyses did not predict the aerodynamic characteristics that were extracted from the Space Shuttle flight test program. Future programs that involve the use of vehicles similar to the Space Shuttle should be concerned with the complex flow fields characteristics of these types of complex configurations. Author

N84-10118*# Rockwell International Corp., Downey, Calif. Space Transportation and System Group.
SPACE SHUTTLE LAUNCH VEHICLE AERODYNAMIC UNCERTAINTIES: LESSONS LEARNED
J. T. Hamilton *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 37-40 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The chronological development and evolution of an uncertainties model which defines the complex interdependency and interaction of the individual Space Shuttle element and component uncertainties for the launch vehicle are presented. Emphasis is placed on user requirements which dictated certain concessions, simplifications, and assumptions in the analytical model. The use of the uncertainty model in the vehicle design process and flight planning support is discussed. The terminology and justification associated with tolerances as opposed to variations are also presented. Comparisons of and conclusions drawn from flight minus predicted data and uncertainties are given. Lessons learned from the Space Shuttle program concerning aerodynamic uncertainties are examined. Author

N84-10119*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
LAUNCH VEHICLE AERODYNAMIC FLIGHT TEST RESULTS
L. M. Gaines, W. L. Osborn, and P. D. Wiltse *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 41-58 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The aerodynamic flight test procedures and results for the Space Shuttle orbiter are presented. The aerodynamic characteristics used in testing were determined from flights STS-1 and through STS-4. Normal force and pitching moment were different than predicted, suggesting an unanticipated aerodynamic force acting upward on the end of the orbiter. However, lateral-directional aerodynamic characteristics were in good management with good predictions. The flight measured aerodynamics are repeatable and show good correlation with angle of attack and angle of sideslip. Author

N84-10120*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
AERODYNAMIC ANALYSIS OF THE LOFT ANOMALY OBSERVED ON ORBITAL FLIGHT TESTS OF THE SPACE SHUTTLE
T. E. Surber and J. S. Stone *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 59-78 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The loft anomaly observed during the launch phase of the orbital flight tests (OFT) of the Space Shuttle is described and evidence that the loft anomaly resulted from previously unobserved aerodynamic phenomena is presented. The anomaly was that the altitude at staging was higher than anticipated. The anticipated altitude profile was predicted on wind tunnel test results that did not accurately simulate the flow between the orbiter vehicle and external tank and did not adequately simulate the engine plumes and thus the base pressures. An analogy is used to relate the flow between the orbiter and external tank to the flow in a two dimensional channel. Plume simulation is identified as a major goal during wind tunnel testing, and a wind tunnel test that was conducted to provide the best possible representation of the plume effect on the channel flow field is described. Author

N84-10121*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
TECHNIQUES FOR ASSESSMENT OF ASCENT AERODYNAMIC CHARACTERISTICS OF THE SPACE SHUTTLE LAUNCH SYSTEM
Kenneth S. Leahy *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 79-94 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

In order to investigate the impact of ascent element aerodynamics on the flight constraints of the Space Shuttle, a system of programs was developed which allowed the assessment of wind-tunnel data, the extraction of aerodynamic coeffients, the identification of critical structural load indicators and their margins, the calculation of mission-unique shaping parameters and the evaluation of prelaunch wind measurements. Author

N84-10122*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUPERSONIC LOADS DUE TO SHUTTLE-ORBITER/EXTERNAL-TANK ATTACHMENT STRUCTURES
C. L. W. Edwards, P. J. Bobbitt, and W. J. Monta *In its* Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 95-138 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A large variety of tests were conducted during development of the Space Shuttle to determine the strength, fatigue, and thermal characteristics of the thermal-protection system of the orbiter. The research and analysis carried out to accurately define and simulate the flow characteristics immediately ahead of the external tank attachment structures are described. The highest known acoustic pressure loads occur in these regions and tests to insure the ability of the titles to withstand these acoustic loads, plus those due to pressure gradient, were thought necessary. First flight-critical wind tunnel tests were therefore conducted in the Langley 8-Foot Transonic Pressure Tunnel (8-Ft. TPT), which simulated the time histories of Shuttle ascent loads on tile arrays bonded to structures which accurately duplicated those of the Shuttle. The time-varying free stream conditions were provided by controlling the deflection angle history of diffuser spoiler flaps in an automated way. Time histories of the critical load parameters imposed on the tile arrays in the tunnel are compared with those expected in flight. Author

N84-10123*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE BOOSTER SEPARATION AERODYNAMICS
Mark K. Craig and Henry S. Dresser (Rockwell International) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 139-158 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A wind tunnel test program of some complexity was used to define the aerodynamic forces exerted on the space shuttle solid rocket boosters and orbiter/external tank during staging. In these tests, problems associated with the use of up to three models in close proximity and with the need to simulate high pressure separation motor plumes were handled in a unique and effective manner. A new method was developed for efficiently organizing data which is a function of a large number of independent variables. Data derived from the test program drastically reduced previous estimates of aerodynamic uncertainties and allowed certification of the separation system at the design maximum staging dynamic pressure. Reduction of flight data has implicitly verified the staging aerodynamics data base and its associated uncertainties. Author

N84-10124*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE LAUNCH DEBRIS: SOURCES, CONSEQUENCES, SOLUTIONS
Mark K. Craig *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 159-186 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Following the first space shuttle flight, the shuttle program established a team to identify and eliminate sources of debris which had caused serious damage to the orbiter thermal protection tiles. An approach was developed for debris identification which involved pre- and post-flight vehicle and pad inspections, analytic assessment of debris transport and impact phenomena, and analysis of various photographic records of the flight. Debris sources identified by this approach were classified as being either hazards to flight or sources of damage which increased vehicle refurbishment costs without having any safety implications. As a result of this assessment, all known hazardous debris sources on the launch vehicle and pad were eliminated; other sources are being removed in a cost effective manner as appropriate. Author

N84-10125*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ASCENT AIR DATA SYSTEM RESULTS FROM THE SPACE SHUTTLE FLIGHT TEST PROGRAM
Ernest R. Hillje and Raymond L. Nelson *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 187-231 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The ascent air data system of the Space Shuttle consists of a simple biconic spike probe on the nose of the external tank. Pressure measurements were calibrated in a wind tunnel to obtain vehicle attitude and speed (relative to the air) and dynamic pressure. The wind tunnel test data analysis and the calibration are discussed in terms of test problems and calibration parameter formulation. The flight pressures are traced from telemetry data to final air data products. Analysis of the flight results showed that static pressure could not be accurately determined at the higher Mach numbers (above approx. 2.0). By replacing static pressure with data from a postflight estimated trajectory the ascent air data system performance met the user requirements. Lessons learned are enumerated, the most important being the need for a thorough systems integration effort. Author

N84-10126*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ORBITER VENTING: LESSONS LEARNED
H. S. Lutfi (Rockwell International) and Raymond L. Nieder *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 231-258 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The orbiter vent system provides dedicated vent areas to permit the gases trapped inside the vehicle to escape during accent. The same vent system also repressurizes the vehicle during entry. The vent system is one of six systems that constitutes the purge, vent and drain subsystem. The orbiter active vent system has been very adaptable to the changing requirements that have occurred during the development of the Space Shuttle orbiter. Good correlation has been obtained between predicted and measured compartment pressures during the orbital flight test (OFT) program. An investigation of the flight data showed that the difference between preflight prediction and the measured values were primarily due to the difference between the baseline external pressures, which was based on subscale wind tunnel test data, and the actual vehicle local external pressures measured during the flight. The current predictions are based on flight derived vent port pressure coefficients since the wind tunnel data does not adequately define the orbiter ascent pressure environment. Author

N84-10127*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
DEVELOPMENT OF SPACE SHUTTLE IGNITION OVERPRESSURE ENVIRONMENT AND CORRELATION WITH FLIGHT DATA
S. Lai *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 259-282 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Transportation (STS) launch vehicles are more complex than other launch vehicles. A comprehensive analysis of the lift-off event is required so that the responses of the vehicle and payloads can be predicted. The transient overpressure induced by ignition of the solid rocket motors (SRM's) is one of the critical design factors assessed for lift-off. The STS-1 ignition overpressure design environment was developed from 6.4-percent scale-model tests in which the Tomahawk solid rocket motors were used to simulate the start-up process of the SRM's. The overpressures measured during STS-1 lift-off were much more severe than predicted. The reasons for this anomaly are discussed in this paper. The 6.4-percent scale model was redesigned and used as a tool to develop an effective ignition overpressure suppression system for STS-2 and subsequent flights. Also presented are advancements in subscale-model simulation and theoretical understanding of this transient overpressure phenomenon that led to the successful development of the fix. Author

N84-10128*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ENTRY LONGITUDINAL AERODYNAMIC COMPARISONS OF FLIGHTS 1-4 WITH PREFLIGHT PREDICTIONS
Paul O. Romere and A. Miles Whitnah *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 283-308 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Shuttle orbiter flight test program has required the aerodynamicist to take a new approach in determining flight characteristics. A conventional flight test program of slowly and cautiously approaching more severe flight conditions was not possible with the orbiter. On the first four orbital flights, The orbiter entered the atmosphere at approximately Mach 29 and decelerated through the Mach range (the subsonic portion of flight had also been flown by another orbiter vehicle during the Approach and Landing Test Program). Certification for these flights was achieved by an extensive wind tunnel test and analysis program. The initial series of flights of the orbiter were heavily instrumented for the purpose of obtaining accurate aerodynamic data. The flight data derived from the entry Mach range provided comparisons between flight and wind tunnel derived predicted data in the areas of both aerodynamic performance and longitudinal trim. B.W.

N84-10129*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A REVIEW OF PREFLIGHT ESTIMATES OF REAL-GAS EFFECTS ON SPACE SHUTTLE AERODYNAMIC CHARACTERISTICS
W. C. Woods, J. P. Arrington, and H. H. Hamilton, II *In its* Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 309-346 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Preflight estimates of the hypersonic aerodynamic characteristics of the Shuttle orbiter were based on a diverse series of research studies using state of the art techniques developed by basic research in the 60's and 70's. Real-gas viscous calculations on simple shapes that were used to evaluate correlation parameters indicated that real-gas effects reduce aerodynamic forces and moments. Inviscid calculations on winged lifting shapes indicated reduced forces and a slight nose-up pitch resulted because of real-gas effects. Analysis of the extensive wind tunnel data base indicated viscous correlation parameters provided the most appropriate extrapolation technique for estimating flight aerodynam-

ics. Variations because of changes in the ratio of specific heats, which was the only available experimental tool for evaluating real-gas effects, indicated that reduced loads and nose-up pitching moments would occur at high altitudes and Mach numbers but that the values would not exceed the tolerances and variations established about the aerodynamic design data book values derived from viscous correlations. During STS-1, nose-up pitching moments exceeded the established variations. B.W.

N84-10130*# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
EXPLANATION OF THE HYPERSONIC LONGITUDINAL STABILITY PROBLEM: LESSONS LEARNED
B. J. Griffith, J. R. Maus, and J. T. Best (Air Force, Analysis snd Evaluation Div.) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 347-381 refs Sponsored in part by Air Force Space Div., NASA-Johnson and AEDC (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Inviscid and viscous CFD codes have been applied to a modified Space Shuttle orbiter geometry to investigate differences between preflight aerodynamic predictions and aerodynamic data from hypersonic reentry flight. Flow field solutions were obtained for wind tunnel conditions and flight conditions to assess Mach number, real-gas, and viscous effects on the reentry aerodynamics of the orbiter. Based on the CFD studies, a methodology model has been developed to (1) extrapolate wind tunnel data to flight conditions and (2) calculate a DCM for use with the Aerodynamic Design Data Book. Comparisons are made with selected flight data. Results of the study indicate that the differences between flight and pre-STS-1 predictions of hypersonic pitching moment are primarily due the to Mach number and real-gas effects. Author

N84-10131*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ORBITER REACTION CONTROL SUBSYSTEM FLIGHT DATA ANOMALIES
J. S. Stone (Rockwell International), J. J. Baumbach (Rockwell International), and B. B. Roberts *In* NASA. Langley Research Center Shuttle Performance: Lessons earned, Part 1 Oct. 1983 p 381-396 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Shuttle orbiter vehicle flight data obtained during operation of the reaction control subsystem (RCS) were compared with predictions derived from RCS wind tunnel test data. This paper reviews the derivation of the wind tunnel data base and discusses how it was used to predict the full-scale RCS effects. Flight and predicted data comparisons include the lateral and directional aerodynamic effects of firing the side jets, longitudinal aerodynamics for pitch jets, and lateral aerodynamics for roll jets. Flight data anomalies resulting from wind tunnel limitations in representing portions of the entry flight trajectory are presented. The cause of each data anomaly is described, as well as a requirement for additional technical analysis to establish RCS effect simulation parameters that can be used to update jet effect technology.
Author

N84-10132*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF SHUTTLE OSCILLATION IN THE MACH NUMBER = 1.7 TO MACH NUMBER = 1.0 RANGE
William T. Suit, Harold R. Compton, William I. Scallion, James R. Schiess, and L. Sue Gahan *In its* Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 397-412 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The first five flights of the Space Transportation System (STS) have exhibited unexpected lateral oscillations in the Mach Number = 1.7 to Mach Number = 1.0 region of the descent trajectory. These oscillations can be split into two parts: a predominantly rolling oscillation referred to as the quarter hertz motion and a long-priod, large-amplitude oscillation in sideslips, roll rate, and yaw rate. These motions are analyzed in this paper in order to determine their source and the mechanism driving them. They will first be examined to determine how much of the motion can be explained using the set of equations that contain linear aerodynamic parameters. Then differences between measured moments and those calculated using linear aerodynamics which are considered to be due to unmodeled moments will be exained. Possible error sources such as not inluding nonlinear aerodynamics in the vehicle model, measurement errors, and the effect of pressure gradients will be considered. Based on these analyses, conclusions as to the nature and cause of the Shuttle lateral oscillations will be drawn. B.W.

N84-10133*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
APPROACH TO ESTABLISHING THE EFFECT OF AEROELASTICITY ON AERODYNAMIC CHARACTERISTICS OF THE SPACE SHUTTLE ORBITER
D. C. Schlosser and D. F. Dominik *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Part 1 Oct. 1983 p 413-446 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The static aeroelastic effects on the longitudinal stability and elevon/aileron effectiveness of the space transportation system (STS) Space Shuttle orbiter were estimated by a simplified approach called the elevon torsional stiffness (ETS) method. This method employs rigid model wind tunnel test results to predict aeroelastic effects. Lateral/directional stability and rudder effectiveness were based on results of a wind tunnel test in which a flexible tail model was used. Comparisons with selective flight data are made in this paper. Results of correlations with flight data (although limited at the present time) verify the predicted aeroelastic effects for the orbiter. The orbiter's structural characteristics are such that the effects of aeroelasticity, whether estimated using analytical techniques or simplified methods, do not appear to affect the vehicle performance to any great extent. The large amount of scatter in the flight-extracted data made verification of the aeroelastic corrections very difficult. Generally, the simplified elevon torsional stiffness method provided better correlation with flight test results than he analytical method and reduced the verification effort and cost. Author

N84-10134*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MINIMUM TESTING OF THE SPACE SHUTTLE ORBITER FOR STABILITY AND CONTROL DERIVATIVES
Douglas R. Cooke *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 447-472 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A unique approach has been developed for stability and control derivative testing of the Space Shuttle orbiter during entry. Shuttle Program requirements have necessitated a minimum of testing. Therefore, flight tests concentrate on potential control problem areas predicted from wind tunnel data as well as anomalies discovered during flight testing. The object is to use the test data to remove center of gravity (cg), angle of attack, and elevon placards which are a function of these potential control problems. To ensure successful aerodynamic extraction from a minimum of testing, the following special measures have been taken. Exact maneuvers are designed preflight on Shuttle simulators. These maneuvers are duplicated and implemented during the flight by onboard software. An onboard instrumentation system was designed especially for aerodynamic parameter identification. State-of-the-art techniques are used in extracting aerodynamics.
B.W.

N84-10135*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STABILITY AND CONTROL OVER THE SUPERSONIC AND HYPERSONIC SPEED RANGE
Harold R. Compton, James R. Schiess, William T. Suit, William I. Scallion, and JoAnn W. Hudgins *In its* Shuttle Performance:

Lessons Learned, Pt. 1 Oct. 1983 p 473-508 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The performance and aerodynamic characteristics of the Space Shuttle Columbia are analyzed over the speed range from Mach 2 to 26 using flight data taken from the first five Space Transportation System flights. These data are used to reconstruct the entry trajectory, calculate vehicle performance, and estimate lateral stability and control derivatives including those assocated with the onboard Reaction Control System. The trajectory reconstruction process is discussed in its relationship to the determination of the vehicle flight characteristics. Vehicle performance results are presented which show that lift and drag were generally overpredicted by 3 percent and that the life-to-drag ratio was underpredicted by 1 percent. Anomalies in pitching-moment trim characteristics are shown and noted to be due to real-gas and Mach-number effects. Lateral stability and control derivatives estimated using programmed test input maneuvers are corrected with preflight predictions and are usually within the uncertainties associated with the predictions. The lateral reaction-control system effectiveness is evaluated. R.J.F.

N84-10136*# Air Force Flight Test Center, Edwards AFB, Calif.
PREDICTED AND FLIGHT TEST RESULTS OF THE PERFORMANCE, STABILITY AND CONTROL OF THE SPACE SHUTTLE FROM REENTRY TO LANDING
Paul W. Kirsten, David F. Richardson, and Charles M. Wilson *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 509-524 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Aerodynaic performance, stability and control data obtained from the first five reentries of the Space Shuttle orbiter are given. Flight results are compared to pedicted data from Mach 26.4 to Mach 0.4. Differences between flight and predicted data as well as probable causes for the discrepancies are given. R.J.F.

N84-10137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LATERAL-DIRECTIONAL STABILITY INVESTIGATION OF THE SPACE SHUTTLE ORBITER AT MACH 6
Robert L. Calloway *In its* Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 525-548 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Lateral-directional aerodynamic data and oil-flow visualization results are pesented from four tests (conducted in two facilities using three models) which were designed to verify the hypersonic aerodynamics of the Space Shuttle orbiter at M=6. Comparisons of measured lateral-directional stability data and oil-flow results between the tests show excellent agreement, especially considering the nonuniform, unpredictable flow which occurs in the vicinity of the vertical tail. Results ere shown to be sensitive to Reynolds number with the higher Reynolds number cases producing more stable values and also showing good agreement with flight values. The results also show that the effects of Reynolds number, angle of attack, and angle of sideslip on the lateral-directional stability of future entry configuration should be carefully assessed for non-linearities. Author

N84-10138*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC COEFFICIENT IDENTIFICATION PACKAGE DYNAMIC DATA ACCURACY DETERMINATIONS: LESSONS LEARNED
Michael L. Heck (Analytical Mechanics Assoc., Inc.), John T. Findlay (Analytical Mechanics Assoc., Inc.), and Harold R. Compton *In its* Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 549-571 refs (For primary document see N84-10115 01-16) (Contract NAS1-16087)
Avail: NTIS HC A99/MF A01 CSCL 22B

The errors in the dynamic data output from the Aerodynamic Coefficient Identification Packages (ACIP) flown on Shuttle flights 1, 3, 4, and 5 were determined using the output from the Inertial Measurement Units (IMU). A weighted least-squares batch algorithm was empolyed. Using an averaging technique, signal detection was enhanced; this allowed improved calibration solutions. Global errors as large as 0.04 deg/sec for the ACIP gyros, 30 mg for linear accelerometers, and 0.5 deg/sec squared in the angular accelerometer channels were detected and removed with a combination is bias, scale factor, misalignment, and g-sensitive calibration constants. No attempt was made to minimize local ACIP dynamic data deviations representing sensed high-frequency vibration or instrument noise. Resulting 1sigma calibrated ACIP global accuracies were within 0.003 eg/sec, 1.0 mg, and 0.05 deg/sec squared for the gyros, linear accelerometers, and angular accelerometers, respectively. R.J.F.

N84-10139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTELY DRIVEN MODEL CONTROL SURFACES FOR EFFICIENT WIND-TUNNEL OPERATIONS
George M. Ware, Bernard Spencer, Jr., and L. Raymond Gentry *In its* Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 573-579 Presented at the AIAA 21st Aerospace Sci., Reno, Nev., 10-13 Jan. 1983 Previously announced as 83A-16556 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A remote control system for wind-tunnel model control surfaces was developed during the Space Shuttle program to make more efficient use of wind-tunnel occupancy time and to aid in gathering the large force test data base necessary for the definition of the Shuttle aerodynamic characteristics. A history of the development of the remote system, details of the system and associated equipment, and results from wind-tunnel tests showing the effect of system improvements on experimental data are given. Wind-tunnel test rate and cost comparisons are made between conventional models with bracketed control surfaces and remote models. R.J.F.

N84-10140*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE ASCENT GN&C POSTFLIGHT RESULTS
Gene McSwain *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 581-594 (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The key features of the ascent and Guidance navigation, and control (GN and C) system are discussed. How well this system performed during the orbital flight test program is examined. Flight results are compared with preflight predictions and postflight reconstructions. Variations from expected performance are identified as well as flight-to-flight trends. The most notable variation was the lofted trajectory observed on the Space Transportation System 1 flight. The lessons learned from the orbital flight test program are being used to enhance the overall system performance for future Shuttle flights. Several of the planned GN and C system enhancements are discussed. R.J.F.

N84-10141*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE APPLICATION OF AERODYNAMIC UNCERTAINTIES IN THE DESIGN OF THE ENTRY TRAJECTORY AND FLIGHT CONTROL SYSTEM OF THE SPACE SHUTTLE ORBITER
Joe D. Gamble *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 595-616 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The process used in the application of aerodynamic uncertainties for the design and verification of the Space Shuttle Orbiter Entry Flight Control System is presented. The uncertainties were used to help set center of gravity, angle of attack and dynamic pressure lateral control divergence parameter as well as C sub n sub beta dynamic were instrumental in setting these placards. Author

N84-10142*# Honeywell, Inc., Clearwater, Fla.
SPACE SHUTTLE DESCENT FLIGHT CONTROL DESIGN REQUIREMENTS AND EXPERIMENTS
G. Kafer and D. Wilson *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 617-628 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Some of the lessons learned during the development of the Space Shuttle descent flight control system (FCS) are reviewed. Examples confirm the importance for requirements definition, systems level analyses, and testing. In sounding these experiences may have implication for future designs or suggest the discipline required in this engineering art. R.J.F.

N84-10143*# Air Force Flight Test Center, Edwards AFB, Calif.
APPROACH AND LANDING CHARACTERISTICS OF THE SPACE SHUTTLE ORBITER
Cynthia A. Bourne and Paul W. Kirsten *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 1 Oct. 1983 p 637-651 refs (For primary document see N84-10115 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The first five Space Shuttle orbiter landng during the Orbital Flight Test program are analyzed with respect to the unique requirement to perform routine experience during the Approach and Landing Tests is also considered. Results are presented on energy control, handing qualities, and landing distance. Author

N84-10144*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE PERFORMANCE: LESSONS LEARNED, PART 2
James P. Arrington, comp. and Jim J. Jones, comp. Washington Oct. 1983 746 p refs Conf. held in Hampton, Va., 8-10 Mar. 1983 2 Vol.
(NASA-CP-2283-Pt-2; L-15673-Pt-2; NAS 55:2283-Pt-2) Avail: NTIS HC A99/MF A01 CSCL 22B

Several areas of Space Shuttle technology were addressed including aerothermal environment, thermal protection, measurement and analysis, Shuttle carrier aerodynamics, entry analysis of the STS-3, and an overview of each section. For individual titles, see N84-10145 through N84-10170.

N84-10145*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CALCULATION OF SHUTTLE BASE HEATING ENVIRONMENTS AND COMPARISON WITH FLIGHT DATA
Terry F. Greenwood, Young C. Lee, Robert L. Bender (Remtech, Inc., Huntsville, Ala.), and Robert E. Carter (LMSC, Sunnyvale, Calif.) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 653-686 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The techniques, analytical tools, and experimental programs used initially to generate and later to improve and validate the Shuttle base heating design environments are discussed. In general, the measured base heating environments for STS-1 through STS-5 were in good agreement with the preflight predictions. However, some changes were made in the methodology after reviewing the flight data. The flight data is described, preflight predictions are compared with the flight data, and improvements in the prediction methodology based on the data are discussed. Author

N84-10146*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TRENDS IN SHUTTLE ENTRY HEATING FROM THE CORRECTION OF FLIGHT TEST MANEUVERS
James K. Hodge *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 687-702 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A new technique was developed to systematically expand the aerothermodynamic envelope of the Space Shuttle Protection System (TPS). The technique required transient flight test maneuvers which were performed on the second, fourth, and fifth Shuttle reentries. Kalman filtering and parameter estimation were used for the reduction of embedded thermocouple data to obtain best estimates of aerothermal parameters. Difficulties in reducing the data were overcome or minimized. Thermal parameters were estimated to minimize uncertainties, and heating rate parameters were estimated to correlate with angle of attack, sideslip, deflection angle, and Reynolds number changes. Heating trends from the maneuvers allow for rapid and safe envelope expansion needed for future missions, except for some local areas. Author

N84-10147*# Air Force Flight Test Center, Edwards AFB, Calif.
FLIGHT TEST DERIVED HEATING MATH MODELS FOR CRITICAL LOCATIONS ON THE ORBITER DURING REENTRY
Elam K. Hertzler and Paul W. Phillips *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 703-718 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

An analysis technique was developed for expanding the aerothermodynamic envelope of the Space Shuttle without subjecting the vehicle to sustained flight at more stressing heating conditions. A transient analysis program was developed to take advantage of the transient maneuvers that were flown as part of this analysis technique. Heat rates were derived from flight test data for various locations on the orbiter. The flight derived heat rates were used to update heating models based on predicted data. Future missions were then analyzed based on these flight adjusted models. A technique for comparing flight and predicted heating rate data and the extrapolation of the data to predict the aerothermodynamic environment of future missions is presented. Author

N84-10148*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
ORBITER ENTRY HEATING LESSONS LEARNED FROM DEVELOPMENT FLIGHT TEST PROGRAM
J. W. Haney *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 719-753 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Shuttle orbiter's thermal protection system (TPS), designed mainly on the basis of wind tunnel test data, has successfully completed its design, development, and flight test program. The flight test data provide an exceptional opportunity to evaluate the use of wind tunnel test data for the design of TPS for reentry vehicles. Comparisons of flight test data against wind tunnel data used to design the orbiter's TPS were developed. These flight data, though still in the preliminary analysis phases, generally support the use of wind tunnel test data in the design of TPS for hypersonic reentry vehicles. Author

N84-10149*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE ORBITER BOUNDARY LAYER TRANSITION AT FLIGHT AND WIND TUNNEL CONDITIONS
Winston D. Goodrich, Stephen M. Derry, and John J. Bertin (Texas Univ., Austin) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 753-780 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Hypersonic boundary layer transition data obtained on the windward centerline of the Shuttle orbiter during entry for the first five flights are presented and analyzed. Because the orbiter surface is composed of a large number of thermal protection tiles, the transition data include the effects of distributed roughness arising from tile misalignment and gaps. These data are used as a benchmark for assessing and improving the accuracy of boundary layer transition predictions based on correlations of wind tunnel data taken on both aerodynamically rough and smooth orbiter surfaces. By comparing these two data bases, the relative importance of tunnel free stream noise and surface roughness on

orbiter boundary layer transition correlation parameters can be assessed. This assessment indicates that accurate predications of transition times can be made for the orbiter at hypersonic flight conditions by using roughness dominated wind tunnel data. Specifically, times of transition onset and completion is accurately predicted using a correlation based on critical and effective values of a roughness Reynolds number previously derived from wind tunnel data. Author

N84-10150*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
ORBITER WINDWARD SURFACE ENTRY HEATING: POST-ORBITAL FLIGHT TEST PROGRAM UPDATE
M. H. Harthun, C. B. Blumer, and B. A. Miller *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 781-804 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Correlations of orbiter windward surface entry heating data from the first five flights are presented with emphasis on boundary layer transition and the effects of catalytic recombination. Results show that a single roughness boundary layer transition correlation developed for spherical element trips works well for the orbiter tile system. Also, an engineering approach for predicting heating in nonequilibrium flow conditions shows good agreement with the flight test data in the time period of significant heating. The results of these correlations, when used to predict orbiter heating for a high cross mission, indicate that the thermal protection system on the windward surface will perform successfully in such a mission. Author

N84-10151*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
VISCOUS SHOCK-LAYER PREDICTIONS OF THREE-DIMENSIONAL NONEQUILIBRIUM FLOWS PAST THE SPACE SHUTTLE AT HIGH ANGLE OF ATTACK
M. D. Kim, S. Swaminathan, and Clark H. Lewis *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 805-825 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Computational solutions were obtained for chemically reacting flowfields over the entire windward surface of the Space Shuttle at high angle of attack. The recently developed computational method for the Space Shuttle is capable of treating three dimensional viscous nonequilibrium air flow as well as equilibrium air and perfect gas flows. A general nonorthogonal computational grid system is used to treat the nonaxisymmetric geometry. Boundary conditions take into account noncatalytic wall, equilibrium with noncatalytic wall condition are compared to the fully catalytic wall solutions, the equilibrium air solutions, the perfect gas solutions, and also the Shuttle flight heating and pressure data. The comparisons show good agreement and correlations in most cases. Author

N84-10152*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CATALYTIC SURFACE EFFECTS ON SPACE THERMAL PROTECTION SYSTEM DURING EARTH ENTRY OF FLIGHTS STS-2 THROUGH STS-5
David A. Stewart, John V. Rakich, and Martin J. Lanfranco (Informatics, Inc., Palo Alto, Calif.) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 827-845 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

An on going orbiter experiment catalytic surface effects experiment being conducted on the Space Shuttle is discussed. The catalytic surface effects experiment was peformed on four of the five flights of Columbia. Temperature time histories and distributions along the midfuselage and wing of the orbiter were used to determine the surface catalytic efficiency of the baseline high temperature reusable surface insulation. Correlation parameters are shown that allow the comparison of all flight data with predictions from the design and surface emittance decreased as a result of contaminants during the five flights of the Space Shuttle. R.J.F.

N84-10153*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ORBITER CATALYTIC/NONCATALYTIC HEAT TRANSFER AS EVIDENCED BY HEATING TO CONTAMINATED SURFACES ON STS-2 AND STS-3
David A. Throckmorton, E. Vincent Zoby, and H. Harris hamilton, II *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 847-864 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

During that portion of Space Shuttle orbiter entry when significant aerodynamic heat transfer occurs, the flow over the vehicle is in chemical nonequilibrium. The parameter which most significantly influences the level of surface heat transfer in such a flow field is the catalytic efficiency of the surface with respect to the recombination of dissociated oxygen atoms. Significant, and instantaneous, changes were observed in the level of heat transfer at several lower surface centerline locations on STS-2 and STS-3. This phenomenon apparently resulted from a sudden change in the surface catalytic efficiency at these locations due to contamination of the surface by metallic oxides. As a result, data obtained from affected measurements cannot be considered as benchmark data with which to attempt to characterize nonequilibrium heat transfer to the orbiter's lower surface centerline. Author

N84-10154*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A REVIEW OF NONEQUILIBRIUM EFFECTS AND SURFACE CATALYSIS ON SHUTTLE HEATING
Carl D. Scott *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 865-890 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

A review is given of the nonequilibrium calculation techniques by various authors over the past decade to predict heat fluxes to the windward side of the Space Shuttle orbiter. The results of these techniques are compared with measurements made on the first few flights of the Space Shuttle. The calculations attempt to account for finite rate chemistry in the shock layer around the vehicle and for finite rate catalytic atom recombination on the thermal protection materials. The techniques considered are the axisymmetric viscous shock layer method, three dimensional reacting Euler equation solutions coupled with axisymmetric analog boundary layer method, and a recently developed nonequilibrium 3-D viscous shock layer method. Author

N84-10155*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FILLER BAR HEATING DUE TO STEPPED TILES IN THE SHUTTLE ORBITER THERMAL PROTECTION SYSTEM
D. H. Petley, D. M. Smith, C. L. W. Edwards, A. B. Patten, and H. Harris Hamilton, II *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 891-912 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

An analytical study was performed to investigate the excessive heating in the tile to tile gaps of the Shuttle Orbiter Thermal Protection System due to stepped tiles. The excessive heating was evidence by visible discoloration and charring of the filler bar and strain isolation pad that is used in the attachment of tiles to the aluminum substrate. Two tile locations on the Shuttle orbiter were considered, one on the lower surface of the fuselage and one on the lower surface of the wing. The gap heating analysis involved the calculation of external and internal gas pressures and temperatures, internal mass flow rates, and the transient thermal response of the thermal protection system. The results of the analysis are presented for the fuselage and wing location for several step heights. The results of a study to determine the effectiveness of a half height ceramic fiber gap filler in preventing hot gas flow in the tile gaps are also presented. Author

N84-10156*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LEEWARD CENTERLINE AND SIDE FUSELAGE ENTRY HEATING PREDICTIONS FOR THE SPACE SHUTTLE ORBITER
Vernon T. Helms, III *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 913-947 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Heat transfer data measured along the leeward centerline and on the side fuselage of the Space Shuttle orbiter during STS-2 and STS-3 are compared with predictions of empirical heating techniques derived from wind tunnel tests. Steps required to extrapolate an existing leeward centerline theory to flight conditions are described. Generally favorable comparisons from Mach 24 down to approximately Mach 7 for both flights are presented. The side fuselage impingement heating method is currently under development, but some preliminary results are available. The method is briefly described and compared with wind tunnel and flight measurements. Side heating predictions are given for an STS-3 trajectory point near Mach 10 showing good agreement with flight data. There is evidence of embedded vortices emanating from the side fuselage impingement line which significantly enhance local heating rates at both wind tunnel and flight conditions.
Author

N84-10157*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ORBITER REUSABLE SURFACE INSULATION FLIGHT RESULTS
Robert L. Dotts, James A. Smith, and Donald J. Tillian *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 949-966 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The first five flights of the orbiter Columbia provided the initial data required to certify the operational performance of the reusable surface insulation (RSI) thermal protection system (TPS). The flight performance characteristics of the RIS TPS are discussed. The discussion is based primarily on postflight inspections and postflight interpretation of the flight instrumentation. TPS modifications of the future orbiters (OV-099, 103, and subs) are also discussed.
R.J.F.

N84-10158*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
LESSONS LEARNED FROM THE DEVELOPMENT AND MANUFACTURE OF CERAMIC REUSABLE SURFACE INSULATION MATERIALS FOR THE SPACE SHUTTLE ORBITERS
Ronald P. Banas, Donald R. Elgin, Edward R. Cordia, Kenneth N. Nickel, Edward R. Gzowski, and Lawrence Aguiler *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 967-1008 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Three ceramic, reusable surface insulation materials and two borcsilicate glass coatings were used in the fabrication of tiles for the Space Shuttle orbiters. Approximately 77,000 tiles were made from these materials for the first three orbiters, Columbia, Challenger, and Discovery. Lessons learned in the development, scale up to production and manufacturing phases of these materials will benefit future production of ceramic reusable surface insulation materials. Processing of raw materials into tile blanks and coating slurries; programming and machining of tiles using numerical controlled milling machines; preparing and spraying tiles with the two coatings; and controlling material shrinkage during the high temperature (2100-2275 F) coating glazing cycles are among the topics discussed.
R.J.F.

N84-10159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIFE CONSIDERATIONS OF THE SHUTTLE ORBITER DENSIFIED-TILE THERMAL PROTECTION SYSTEM
Paul A. Cooper and James Wayne Sawyer *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1009-1024 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Shuttle orbiter themal protection system (TPS) incorporates ceramic reusable surface insulation tiles bonded to the orbiter substructure through a strain isolation pad. Densification of the bonding surface of the tiles increases the static strength of the tiles. The densification proces does not, however, necessarily lead to an equivalent increase in fatigue strength. Investigation of the expected lifetime of densified tile TPS under both sinusoidal loading and random loading simulating flight conditions indicates that the strain isolation pads are the weakest components of the TPS under fatigue loading. The felt pads loosen under repetitive loading and, in highly loaded regions, could possibly cause excessive step heights between tiles causing burning of the protective insulation between tiles. A method of improving the operational lifetime of the TPS by using a strain isolation pad with increased stiffness is presented as is the consequence of the effect of increased stiffness on the tile inplane strains and transverse stresses.
Author

N84-10160*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
SHUTTLE TPS THERMAL PERFORMANCE AND ANALYSIS METHODOLOGY
W. E. Neuenschwander, D. U. McBride, and G. A. Armour *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1025-1064 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Thermal performance of the thermal protection system was approximately as predicted. The only extensive anomalies were filler bar scorching and over-predictions in the high Delta p gap heating regions of the orbiter. A technique to predict filler bar scorching has been developed that can aid in defining a solution. Improvement in high Delta p gap heating methodology is still under study. Minor anomalies were also examined for improvements in modeling techniques and prediction capabilities. These include improved definition of low Delta p gap heating, an analytical model for inner mode line convection heat transfer, better modeling of structure, and inclusion of sneak heating. The limited number of problems related to penetration items that presented themselves during orbital flight tests were resolved expeditiously, and designs were changed and proved successful within the time frame of that program.
R.J.F.

N84-10161*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ORBITER LEADING-EDGE FLIGHT PERFORMANCE COMPARED TO DESIGN GOALS
Donald M. Curry, David W. Johnson (Vought Corp., Dallas, Tex.), and Robert E. Kelly (Rockwell International Corp., Downey, Calif.) *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1065-1082 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Thermo-structural performance of the Space Shuttle orbiter Columbia's leading-edge structural subsystem for the first five (5) flights is compared with the design goals. Lessons learned from thse initial flights of the first reusable manned spacecraft are discussed in order to assess design maturity, deficiencies, and modifications required to rectify the design deficiencies. Flight data and post-flight inspections support the conclusion that the leading-edge structural subsystem hardware performance was outstanding for the initial five (5) flights.
Author

N84-10162*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.
SPACE SHUTTLE WING LEADING EDGE HEATING ENVIRONMENT PREDICTION DERIVED FROM DEVELOPMENT FLIGHT DATA
John A. Cunningham and Joseph W. haney, Jr. *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1083-1109 refs (For primary document see N84-10144 01-16)

Avail: NTIS HC A99/MF A01 CSCL 22B

An analytical program is in progress at Rockwell International to revise wing leading edge heating predictions in order to improve correlation with STS-1 to -5 flight radiometer data. This paper discusses the methods that have been used to improve agreement between prediction and flight and summarizes the aerodynamic correlations which, when updated, will be used to analyze future orbiter missions. Author

N84-10163*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SUBSONIC LONGITUDINAL PERFORMANCE COEFFICIENT EXTRACTION FROM SHUTTLE FLIGHT DATA: AN ACCURACY ASSESSMENT FOR DETERMINATION OF DATA BASE UPDATES

John T. Findlay, G. Mel Kelly, Judy G. McConnell, and Harold R. Compton *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1111-1168 refs (For primary document see N84-10144 01-16)

(Contract NAS1-16087)

Avail: NTIS HC A99/MF A01 CSCL 22B

Longitudinal performance comparisons between flight derived and predicted values are presented for the first five NASA Space Shuttle Columbia flights. Though subsonic comparisons are emphasized, comparisons during the transonic and low supersonic regions of flight are included. Computed air data information based on the remotely sensed atmospheric measurements as well as in situ Orbiter Air Data System (ADS) measurements were incorporated. Each air data source provides for comparisons versus the predicted values from the LaRC data base. Principally, L/D, C sub L, and C sub D, comparisons are presented, though some pitching moment results are included. Similarities in flight conditions and spacecraft configuration during the first five flights are discussed. Contributions from the various elements of the data base are presented and the overall differences observed between the flight and predicted values are discussed in terms of expected variations. A discussion on potential data base updates is presented based on the results from the five flights to date. Author

N84-10164*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE DEVELOPMENT OF AERODYNAMIC UNCERTAINTIES FOR THE SPACE SHUTTLE ORBITER

James C. Young and Jimmy M. Underwood *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1169-1186 refs (For primary document see N84-10144 01-16)

Avail: NTIS HC A99/MF A01 CSCL 22B

The Shuttle Program development schedule and the management decision to perform an orbital, manned mission on the first launch resulted in a requirement to develop realistic aerodynamic uncertainties for the preflight aerodynamic predictions. This paper addresses the methodology in developing two types of aerodynamic uncertainties. One involves the ability to reproduce aerodynamic results between various wind tunnel tests. The second addresses the difference between preflight aerodynamic predictions and flight results derived from analysis of past aircraft programs. Both types of uncertainties for pitching moment, lateral-directional stability, rudder power, and aileron power are presented. In addition, the application of uncertainties to flight control design and fight test planning is briefly reviewed. Author

N84-10165*# Rockwell International Corp., Downey, Calif. Space Transportation and Systems Group.

THE CALIBRATION AND FLIGHT TEST PERFORMANCE OF THE SPACE SHUTTLE ORBITER AIR DATA SYSTEM

Alden S. Dean and Arthur L. Mena *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1187-1212 refs (For primary document see N84-10144 01-16)

Avail: NTIS HC A99/MF A01 CSCL 22B

The Space Shuttle air data system (ADS) is used by the guidance, navigation and control system (GN&C) to guide the vehicle to a safe landing. In addition, postflight aerodynamic analysis requires a precise knowledge of flight conditions. Since the orbiter is essentially an unpowered vehicle, the conventional methods of obtaining the ADS calibration were not available; therefore, the calibration was derived using a unique and extensive wind tunnel test program. This test program included subsonic tests with a 0.36-scale orbiter model, transonic and supersonic tests with a smaller 0.2-scale model, and numerous ADS probe-alone tests. The wind tunnel calibration was further refined with subsonic results from the approach and landing test (ALT) program, thus producing the ADS calibration for the orbital flight test (OFT) program. The calibration of the Space Shuttle ADS and its performance during flight are discussed in this paper. A brief description of the system is followed by a discussion of the calibration methodology, and then by a review of the wind tunnel and flight test programs. Finally, the flight results are presented, including an evaluation of the system performance for on-board systems use and a description of the calibration refinements developed to provide the best possible air data for postflight analysis work. Author

N84-10166*# Chrysler Corp., New Orleans, La. Military and Public Electronic Systems.

COMPILING THE SPACE SHUTTLE WIND TUNNEL DATA BASE: AN EXERCISE IN TECHNICAL AND MANAGERIAL INNOVATORS

N. Dale Kemp *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1213-1254 refs (For primary document see N84-10144 01-16)

(Contracts NAS9-13247; NAS9-16283)

Avail: NTIS HC A99/MF A01 CSCL 22B

Engineers evaluating Space Shuttle flight data and performance results are using a massive data base of wind tunnel test data. A wind tunnel test data base of the magnitude attained is a major accomplishment. The Apollo program spawned an automated wind tunnel data analysis system called SADSAC developed by the Chrysler Space Division. An improved version of this system renamed DATAMAN was used by Chrysler to document analyzed wind tunnel data and data bank the test data in standardized formats. These analysis documents, associated computer graphics and standard formatted data were disseminated nationwide to the Shuttle technical community. These outputs became the basis for substantiating and certifying the flight worthiness of the Space Shuttle and for improving future designs. As an aid to future programs this paper documents the lessons learned in compiling the massive wind tunnel test data base for developing the Space Shuttle. In particular, innovative managerial and technical concepts evolved in the course of conceiving and developing this successful DATAMAN system and the methods and organization for applying the system are presented. B.W.

N84-10167*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SHUTTLE FLIGHT PRESSURE INSTRUMENTATION: EXPERIENCE AND LESSONS FOR THE FUTURE

P. M. Siemers, III, P. F. Bradley, H. Wolf (Analytical Mechanics Associates, Inc., Hampton, Va.), P. F. Flanagan (Analytical Mechanics Associates, Inc., Hampton, Va.), K. J. Weilmuenster, and F. A. Kern *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1255-1275 refs (For primary document see N84-10144 01-16)

Avail: NTIS HC A99/MF A01 CSCL 22B

Flight data obtained from the Space Transportation System orbiter entries are processed and analyzed to assess the accuracy and performance of the Development Flight Instrumentation (DFI) pressure measurement system. Selected pressure measurements are compared with available wind tunnel and computational data and are further used to perform air data analyses using the Shuttle Entry Air Data System (SEADS) computation technique. The results are compared to air data from other sources. These comparisons isolate and demonstrate the effects of the various limitations of the DFI pressure measurement system. The effects of these limitations on orbiter performance analyses are addressed, and

instrumentation modifications are recommended to improve the accuracy of similar fight data systems in the future. Author

N84-10168*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPARISON OF MEASURED AND THEORETICAL PREDICTIONS FOR STS ASCENT AND ENTRY SONIC BOOMS
Frank Garcia, Jr. (NASA. Johnson Space Enter), Jess H. Jones (NASA. Marshall Space Flight Center), and Herbert R. Henderson *In its* Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1277-1301 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

Sonic boom measurements have been obtained during the flights of STS-1 through 5. During STS-1, 2, and 4, entry sonic boom measurements were obtained and ascent measurements were made on STS-5. The objectives of this measurement program were (1) to define the sonic boom characteristics of the Space Transportation System (STS), (2) provide a realistic assessment of the validity of xisting theoretical prediction techniques, and (3) establish a level of confidence for predicting future STS configuration sonic boom environments. Detail evaluation and reporting of the results of this program are in progress. This paper will address only the significant results, mainly those data obtained during the entry of STS-1 at Edwards Air Force Base (EAFB), and the ascent of STS-5 from Kennedy Space Center (KSC). The theoretical prediction technique employed in this analysis is the so called Thomas Program. This prediction technique is a semi-empirical method that required definition of the near field signatures, detailed trajectory characteristics, and the prevailing meteorological characteristics as an input. This analytical procedure then extrapolates the near field signatures from the flight altitude to an altitude consistent with each measurement location. B.W.

N84-10169*# Air Force Flight Test Center, Edwards AFB, Calif.
AFFTC OVERVIEW OF ORBITER-REENTRY FLIGHT-TEST RESULTS
Robert G. Hoey *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1303-1316 (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Air Force Flight Test Center (AFFTC) has been participating in the flight testing of the Space Shuttle since 1976. An independent assessment of the reentry and landing capabilities of the Orbiter was conducted with respect to Department of Defense (DOD) missions. This activity is on-going and reports have been published after each flight. AFFTC participation in this conference is not directly related to the DOD assessment activity, however, and the views presented by myself and other AFFTC authors discuss the technical aspects of testing and the technology emanating from these tests. B.W.

N84-10170*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLYING THE ORBITER IN THE APPROACH/LANDING PHASE
Steven R. Nagel *In* NASA. Langley Research Center Shuttle Performance: Lessons Learned, Pt. 2 Oct. 1983 p 1317-1329 refs (For primary document see N84-10144 01-16)
Avail: NTIS HC A99/MF A01 CSCL 22B

The Columbia has completed a spectacularly successful four flight Orbital Flight Test program as well as the first operational mission in which two satellites were deployed. It is unprecedented that a vehicle so complex as the Shuttle could have reached such a state of maturity in so few missions. This maturity is reflected not only in terms of basic performance during dynamic flight phases, but also in the outstanding performance of individual spacecraft systems. Appreciably more CSS time has been logged during entry and particularly in the approach and landing phase than any other segment of the mission profile. The discussion that follows, therefore, will outline this phase in some detail including pilot comments, techniques, crew displays and landing aids. Some problem areas related to landing the Orbiter will be discussed, as well as possible solutions. B.W.

N84-10171*# Teledyne Brown Engineering, Huntsville, Ala. Payload Missions Integration Div.
PAYLOAD MISSIONS INTEGRATION Progress Report, 11 Aug. - 16 Sep. 1983
R. A. K. Mitchell 28 Sep. 1983 46 p refs
(Contract NAS8-32712)
(NASA-CR-170902; NAS 1.26:170902; PMIC-MA03-469-28) Avail: NTIS HC A03/MF A01 CSCL 22A

Highlights of the Payload Missions Integration Contract (PMIC) are summarized. Spacelab Missions no. 1 to 3, OSTA partial payloads, Astro-1 Mission, premission definition, and mission peculiar equipment support structure are addressed. Author

N84-10172*# National Aeronautics and Space Administration, Washington, D. C.
SPACELAB: AN INTERNATIONAL SHORT-STAY ORBITING LABORATORY
Walter Froehlich Oct. 1983 86 p Original contains color illustrations
(NASA-EP-165; NAS 1.19:165) Avail: NTIS Avail: SOD HC $7.00 CSCL 22B

Spacelab was planned and constructed to serve as a suitable host for significant scientific research and technological development. As intended by its European builders and by its American operators, this new facility will serve scientists from many nations and in many scientific disciplines and technological specialties. Spacelab is the outgrowth of steady evolution of space technology. It enables scientists and engineers to go into space for in-orbit research with their own hands and eye-with instruments they have designed and built. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-10173*# Howard Univ., Washington, D. C.
THE DYNAMICS AND CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES, 6 Final Report
Peter M. Bainum Sep. 1983 101 p refs
(Grant NsG-1414)
(NASA-CR-174450; NAS 1.26:174450) Avail: NTIS HC A06/MF A01 CSCL 22B

The controls analysis based on a truncated finite element model of the 122m. Hoop/Column Antenna System focuses on an analysis of the controllability as well as the synthesis of control laws. Graph theoretic techniques are employed to consider controllability for different combinations of number and locations of actuators. Control law synthesis is based on an application of the linear regulator theory as well as pole placement techniques. Placement of an actuator on the hoop can result in a noticeable improvement in the transient characteristics. The problem of orientation and shape

control of an orbiting flexible beam, previously examined, is now extended to include the influence of solar radiation environmental forces. For extremely flexible thin structures modification of control laws may be required and techniques for accomplishing this are explained. Effects of environmental torques are also included in previously developed models of orbiting flexible thin platforms. B.W.

N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS HC A05/MF A01 CSCL 22B

The operation and features of a preprocessor for the Shuttle/Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

N84-10175*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
DEVELOPMENT OF DEPLOYABLE STRUCTURES FOR LARGE SPACE PLATFORM SYSTEMS. VOLUME 1: EXECUTIVE SUMMARY Final Report
H. S. Greenberg Oct. 1983 27 p refs
(Contract NAS8-34677)
(NASA-CR-170913; NAS 1.26:170913; SSD-83-0094-1-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22B

The preponderance of study effort was devoted toward the deployable platform systems study which culminated in the detailed design of a ground test article for future development testing. This design is representative of a prototype square-truss, single-fold building-block design that can construct deployable platform structures. This prototype design was selected through a comprehensive and traceable selection process applied to eight competitive designs. The selection process compared the competitive designs according to seven major selection criteria, i.e., design versatility, cost, thermal stability, meteoroid impact significance, reliability, performance predictability, and orbiter integration suitability. In support of the foregoing, a materials data base, and platform systems technology development needs were established. An erectable design of an OTV hangar was selected and recommended for further design development. This design was selected from five study-developed competitive single-fold and double-fold designs including hard-shell and inflatable designs. Also, two deployable manned module configurations, i.e., a hard-shell and an inflatable design were each developed to the same requirements as the composite of two Space station baseline habitat modules. N.W.

N84-10176*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
DEVELOPMENT OF DEPLOYABLE STRUCTURES FOR LARGE SPACE PLATFORMS. VOLUME 2: DESIGN DEVELOPMENT Final Report
H. S. Greenberg Oct. 1983 183 p refs
(Contract NAS8-34677)
(NASA-CR-170914; NAS 1.26:170914; SSD-83-0094-2-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22B

Design evolution, test article design, test article mass properties, and structural analysis of deployable platform systems are discussed. Orbit transfer vehicle (OTV) hangar development, OTV hangar concept selection, and manned module development are discussed. Deployable platform systems requirements, material data base, technology development needs, concept selection and deployable volume enclosures are also discussed. N.W.

N84-10177*# Alabama Univ., Huntsville. Dept. of Physics.
PLASMA SOURCE FOR SPACECRAFT POTENTIAL CONTROL Quarterly Progress Report, Jul. - Sep. 1983
R. C. Olsen 1983 32 p refs
(Contract NAS8-35339)
(NASA-CR-174552; NAS 1.26:174552) Avail: NTIS HC A03/MF A01 CSCL 22B

A stable electrical ground which enables the particle spectrometers to measure the low energy particle populations was investigated and the current required to neutralize the spacecraft was measured. In addition, the plasma source for potential control (PSPO C) prevents high charging events which could affect the spacecraft electrical integrity. The plasma source must be able to emit a plasma current large enough to balance the sum of all other currents to the spacecraft. In ion thrusters, hollow cathodes provide several amperes of electron current to the discharge chamber. The PSPO C is capable of balancing the net negative currents found in eclipse charging events producing 10 to 100 microamps of electron current. The largest current required is the ion current necessary to balance the total photoelectric current. S.L.

N84-10178# York Univ., Downsview (Ontario). Centre for Research in Experimental Space Science.
NUMERICAL SIMULATION OF SPACECRAFT CHARGING PHENOMENA AT HIGH ALTITUDE Final Report, 1 Mar. 1976 - 31 Aug. 1981
J. G. Laframboise, M. Kamitsuma, S. M. L. Prokopenko, Jen-Shih Chang, and R. Godard 10 Aug. 1982 57 p refs
(Grant AF-AFOSR-2962-76; AF Proj. 2311)
(AD-A130043; AFOSR-83-0549TR) Avail: NTIS HC A04/MF A01 CSCL 22/2

This report describes work done under grant AFOSR-76-2962. This work has included the development of computer programs for simulating spacecraft charging at three levels of complexity: LOCHG, a relatively simple local-charging calculation; CYLVIA, a two dimensional simulation program for treating cylindrical spacecraft cross-sections, and XYCIC, a simulation program for the treatment of a larger variety of two dimensional geometries. This work has also included studies of two physical phenomena which are fundamental to an improved understanding of spacecraft charging: the threshold temperature effect and the barrier effect. Also included is a derivation of two results which appear likely to be of use in future simulation studies: an analytic expression for photoelectron currents on surfaces with variable illumination in electric fields, and a perturbation technique for calculating space-charge density and flux along particle orbits. Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-10179# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
LARGE SPACE INSTRUMENTATION TO MEASURE THE INTERACTION BETWEEN SPACE STRUCTURES AND THE ENVIRONMENT Final Report, 1 Oct. 1981 - 30 Sep. 1982
Ching-I. Meng Dec. 1982 21 p
(Contract MIPR-FY-7121-82-00007; AF Proj. 7661)
(AD-A129990; AFGL-TR-83-0059) Avail: NTIS HC A02/MF A01 CSCL 14/2

The major effort at the Applied Physics Laboratory of the Johns Hopkins University while participating in the Air Force Geophysics Laboratory's planning of the polar orbiting space shuttle payload definition is to provide necessary information on the polar region space environment and suggestions on the various measurements of the interaction between the space structure and the environment. During the first phase, the effort was concentrated on the polar region space environment, and results of the investigation were presented to the first meeting of the IMPS Definition Phase at JPL. During the second phase of the program, the major effort was on the investigation of possible instrumentation to perform measurements of the interaction between space structures and the environment. Four measurements and their instrumentation

were conceived and suggested to the IMPS Definition Team. These are summarized here. Author (GRA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-10180*# Hughes Research Labs., Malibu, Calif.
DEVELOPMENT OF ADVANCED INERT-GAS ION THRUSTERS Final Report
R. L. Poeschel Jul. 1983 89 p refs
(Contract NAS3-22474)
(NASA-CR-168206; NAS 1.26:168206) Avail: NTIS HC A05/MF A01 CSCL 21C

Inert gas ion thruster technology offers the greatest potential for providing high specific impulse, low thrust, electric propulsion on large, Earth orbital spacecraft. The development of a thruster module that can be operated on xenon or argon propellant to produce 0.2 N of thrust at a specific impulse of 3000 sec with xenon propellant and at 6000 sec with argon propellant is described. The 30 cm diameter, laboratory model thruster is considered to be scalable to produce 0.5 N thrust. A high efficiency ring cusp discharge chamber was used to achieve an overall thruster efficiency of 77% with xenon propellant and 66% with argon propellant. Measurements were performed to identify ion production and loss processes and to define critical design criteria (at least on a preliminary basis). S.L.

N84-10181*# Chrysler Corp., New Orleans, La. Electronics Div.
TEST REPORT FOR MSFC TEST NO. 83-2: PRESSURE SCALED WATER IMPACT TEST OF A 12.5 INCH DIAMETER MODEL OF THE SPACE SHUTTLE SOLID ROCKET BOOSTER FILAMENT WOUND CASE AND EXTERNAL TVC PCD
Sep. 1983 99 p refs
(Contract NAS8-35017)
(NASA-CR-170901; NAS 1.26:170901; TN-SM-83-12) Avail: NTIS HC A05/MF A01 CSCL 21H

Water impact tests using a 12.5 inch diameter model representing a 8.56 percent scale of the Space Shuttle Solid Rocket Booster configuration were conducted. The two primary objectives of this SRB scale model water impact test program were: 1. Obtain cavity collapse applied pressure distributions for the 8.56 percent rigid body scale model FWC pressure magnitudes as a function of full-scale initial impact conditions at vertical velocities from 65 to 85 ft/sec, horizontal velocities from 0 to 45 ft/sec, and angles from -10 to +10 degrees. 2. Obtain rigid body applied pressures on the TVC pod and aft skirt internal stiffener rings at initial impact and cavity collapse loading events. In addition, nozzle loads were measured. Full scale vertical velocities of 65 to 85 ft/sec, horizontal velocities of 0 to 45 ft/sec, and impact angles from -10 to +10 degrees simulated. Author

N84-10182*# Space Ordnance Systems, Inc., Canyon Country, Calif.
FEASIBILITY DEMONSTRATION OF BOOSTER CROSS-OVER SYSTEM FOR 3 1/2 INCH SRB/MLP FRANGIBLE NUT SYSTEM Final Report
27 Sep. 1983 69 p
(Contract NAS8-34651)
(NASA-CR-170895; NAS 1.26:170895; TP-8877) Avail: NTIS HC A04/MF A01 CSCL 21H

Recent testing of the SRB/MLP Frangible Nut System (SOS Part Number 114850-9/Boosters P/N 114848-3) at NASA indicated a need to reduce the function time between boosters (2) within a single frangible nut. These boosters are initiated separately by electrical impulse(s). Coupling the output of each detonator with an explosive cross-over would reduce the function time between boosters (independent of electrical impulse) while providing additional redundancy to the system. The objectives of this program were to: provide an explosive cross-over between boosters, reduce function time between boosters to less than one (1) millisecond within a given nut, reduce cost of boosters, be compatible with the existing frangible nut system, and meet requirements of USBI Spec's (nut 10SPC-0030, booster 10SPC-0031). Author

N84-10183*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLID ROCKET BOOSTER THRUST VECTOR CONTROL SUBSYSTEM DESCRIPTION
John Redmon, Jr., comp. Sep. 1983 78 p refs
(NASA-TM-82546; NAS 1.15:82546) Avail: NTIS HC A05/MF A01 CSCL 21H

Major Solid Rocket Booster-Thrust Vector Control (SRB-TVC) subsystem components and subcomponents used in the Space Transportation System (STS) are identified. Simplified schematics, detailed schematics, figures, photographs, and data are included to acquaint the reader with the operation, performance, and physical layout as well as the materials and instrumentation used. Author

N84-10184# Harry Diamond Labs., Adelphi, Md.
FLUIDIC GENERATOR TO POWER ROCKET PROXIMITY FUZE
Carl J. Campagnuolo Jul. 1983 19 p
(DA Proj. 1M4-63615-DE-76)
(AD-A131062; HDL-TM-83-11) Avail: NTIS HC A02/MF A01 CSCL 19/1

A fluidic generator has been designed to satisfy the power requirement of a rocket proximity fuze. The design was based on the generator used with the XM445 time fuze for the Multiple Launch Rocket System (MLRS). Power output was increased to approximately 5 W at pressure above 10 psig by increasing the diameter of the coil wire (No. 30 versus 36 AWG), reducing the number of turns (559 versus 1500), and increasing the value of the coupling capacitor (0.4 versus 0.022 micrometer F) to achieve optimum matching into a 120 load. The product was evaluated in a configuration where open space within the fuze nose cone was reduced to accommodate a fuze antenna. The ability of the generator to survive pressure extremes normally encountered by MLRS flight and to provide sustaining power to a complementary metal-oxide-semiconductor timer at flight apogee was successfully demonstrated. The fluidic generator retains its ability to provide a second independent environmental signature to the safety and arming device. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-10185# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
MUTUAL SOLUBILITY AND PROPERTIES OF POLYOLEFINS AND POLYISOPRENE MIXTURES
A. V. Nikiforova 1982 6 p refs Transl. into ENGLISH from Plast. Massy (USSR), no. 4, 1981 p 36-37
(CSIR-Trans-1647) Avail: NTIS HC A02/MF A01

The properties and structures of SKI-3 synthetic polyisoprene rubber mixtures with PE and PP prepared in the internal mixer were investigated. The mixing temperature of the polymers, at 20 to 25 C, was above the melting temperature (t sub melt) of polyolefin; the mixture was mixed for 10 min and cooled to room temperature over a period of approximately 30 min. Vulcanization of rubber mixtures with PE and PP was carried out with sulphur at 100 and 143 C. The mututal solubility of SKI-3, oligoners PE and PP and of rubber and high-molecular weight polyolefins in the melt, was measured by the interference microscopy method and the binodal branching graph representing the phase conditions of the system were studied. The density of the mixtures was

determined by means of a graduated column filled with a mixture of water and isopropanol at 25 C. The viscosity of the mixtures was investigated using a PPR apparatus at constant shear speed and 70 C. Stresses causing failure with vulcanizate in accordance with GOS 270 to 64 were investigated at room temperature. N.W.

24 COMPOSITE MATERIALS

Includes laminates.

N84-10186 Michigan Univ., Ann Arbor.
CURING OF GRAPHITE/EPOXY COMPOSITES Ph.D. Thesis
Alfred Charles Loos 1982 156 p
Avail: Univ. Microfilms Order No. DA8304535

Models were developed which describe the curing process of composites constructed from continuous fiber-reinforced, thermosetting resin matrix prepreg materials. On the basis of the models, a computer code was developed, which for flat-plate composites cured by a specified cure cycle, provides the temperature distribution, the degree of cure of the resin, and the resin viscosity, inside the composite. In addition, the computer code can be used to determine the amount of resin flow out of the composite and the resin content of the composite and the bleeder. Tests were performed measuring the temperature distribution in and the resin flow out of composites constructed from Hercules AS/3501-6 graphite/epoxy prepreg tape. The data were compared with results calculated with the computer code for the conditions employed in the tests. Good agreement was found between the data and the results of the computer code indicating that the model describes adequately the temperature distribution and resin flow. A parametric study also was performed to illustrate how the model and the associated computer code can be used to determine the appropriate cure cycle for a given application, which results in a composite that is cured uniformly in the shortest amount of time.
Dissert. Abstr.

N84-10187# British Library Lending Div., Boston Spa (England).
STRUCTURAL ANOMALY IN COMPOSITE MATERIAL
A. A. Baranov and V. V. Pashinskii 15 Aug. 1983 3 p ref Transl. into ENGLISH from Izv. (USSR), v. 10, 1982 p 157
(BLL-M-35170-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The anomalous low carbon layer in, for example, a composite material produced by filling a high carbon steel shell with molten low carbon steel is possibly attributable to the fact that oxides on the surface of the insert can double carbon activity and give rise to localized removal of carbon from the diffusion layer on the boundary between the insert and shell.
Author

N84-10188*# Lockheed Corp., Burbank, Calif.
FLIGHT SERVICE EVALUATION OF KEVLAR-49 EPOXY COMPOSITE PANELS IN WIDE-BODIES COMMERCIAL TRANSPORT AIRCRAFT Annual Flight Service Report, Jan. - Dec. 1982
R. H. Stone Feb. 1983 40 p refs
(Contract NAS1-11621)
(NASA-CR-166065; NAS 1.26:166065; AFSR-9) Avail: NTIS HC A03/MF A01 CSCL 11D

Kevlar-49 fairing panels, installed as flight service components on three L-1011s, were inspected after 9 years of service. There are six Kevlar-49 panels on each aircraft: a left hand and right hand set of a wing body sandwich fairing; a solid laminate under wing fillet panel; and a 422 K (300 F) service aft engine fairing. The fairings have accumulated a total of 70,000 hours, with one ship set having over 24,000 hours service. The Kevlar-49 components were found to be performing satisfactorily in service with no major problems, or any condition requiring corrective action. The only defects noted were minor impact damage, a few minor disbonds and a minor degree of fastener hole fraying and elongation. These are for the most part comparable to damage noted on fiberglass fairings. The service history to date indicates that Kevlar-49 epoxy composite materials have satisfactory service characteristics for use in aircraft secondary structure.
S.L.

N84-10189# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF HIGH PRESSURES AND TEMPERATURES IN PYROLYTIC BORON NITRIDE
I. S. Gladkaja 1982 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Neorg. Mater. (USSR), v. 17, no. 9, Sep. 1981 p 1603-07
(CSIR-1684) Avail: NTIS HC A02/MF A01

The direct phase transformations of boron nitride have received considerable attention lately. Although a number of experimental studies were devoted to the graphitic-cubic-wurtzitic boron nitride transformation, with the exception of the study of shock waves, no data are available on the behavior of the structure of laminated boron nitride under conditions of static pressures and temperatures and on the effect of the degree of its crystalline perfection on the formation of the cubic modification of boron nitride. Depending on the method of preparation and the conditions of thermal treatment, the degree of crystalline perfection of boron nitride changes within wide limits - from a three dimensional to a two dimensional structure (equivalent to a turbostratic structure in graphite), with a series of intermediate structures is known. The results of an X ray investigation into the behavior of pyrolytic boron nitride at pressures of 3.0 to 9.0 GPa and temperatures of 500 to 2500 K are presented.
Author

N84-10190# Council for Scientific and Industrial Research, Pretoria (South Africa).
STRUCTURES AND PROPERTIES OF NEW TYPES OF CUBICAL BORON NITRIDE
D. D. Sulzenko et al 1982 4 p refs Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 3, 1980 p 17-18
(CSIR-Trans-1683) Avail: NTIS HC A02/MF A01

Powdered cubical boron nitride (CBN) has great strength, heat resistance and chemical inertia with respect to iron and is widely used in the tool industry in the manufacture of tools for machining high speed steel, low workability steel and hardened steel. A form of CBN with increased thermal resistance cubonite KT (trade name Kibor) - was developed at the Institute of Superhard Materials as a result of refinements in reaction compositions and synthesis conditions. The Materials Research Institute of the AN USSR participated in the development of the catalyst solvent. The cubonite KT was obtained using special mineralizers and synthesis activators in a process in which nitrogen is retained near the growing crystals.
Author

N84-10191# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
CURING OF GRAPHITE/EPOXY COMPOSITES Interim Technical Report, Jun. 1982 - Mar. 1983
Alfred C. Loos and George S. Springer Wright-Patterson AFB, Ohio AFWAL Mar. 1983 158 p refs
(Contract F33615-81-C-5050)
(AD-A130071; AFWAL-TR-83-4040) Avail: NTIS HC A08/MF A01 CSCL 11/4

Models were developed which describe the curing process of composites constructed from continuous fiber-reinforced, thermosetting resin matrix prepeg materials. On the basis of the models, a computer code was developed, which for flat-plate composites cured by a specified cure cycle, provides the temperature distribution, the degree of cure of the resin, and the resin viscosity, inside the composite. In addition, the computer code can be used to determine the amount of resin flow out of the composite and the resin content of the composite and the bleeder. Tests were performed measuring the temperature distribution in and the resin flow out of composites constructed from Hercules AS/3501-6 graphite/epoxy prepeg tape. The data was compared with results calculated with the computer code for the conditions employed in the tests. Good agreement was found between the data and the results of the computer code indicating that the model describes adequately the temperature distribution and resin flow. A parametric

study was also performed to illustrate how the model and the associated computer code can be used to determine the appropriate cure cycle for a given application, which results in a composite that is cured uniformly in the shortest amount of time.

Author (GRA)

N84-10192# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.

NONDESTRUCTIVE FT-IR SAMPLING TECHNIQUE TO STUDY GLASS FIBER COMPOSITE INTERFACES

S. R. Culler, H. Ishida, and J. L. Koenig 20 Jun. 1983 30 p refs

(Contract N00014-80-C-0533)

(AD-A129871; CWRU/DMS/TR-9) Avail: NTIS HC A03/MF A01 CSCL 11/4

A nondestructive FT-IR sampling technique was developed to study glass fiber composites. Two coupling agents, Gamma-APS (Gamma-aminopropyltriethoxysilane) were used to test the validity of the technique. The spectra obtained were compared with those obtained using the KBr pellet and diffuse reflectance techniques. The new technique was sensitive to changes in the coupling agent structure induced by heating, changing the drying environment, and pH. This technique could be used to monitor surface treatments on glass mats or to do quantitative studies of such systems in the 3800 to 1100/cm range of the mid-infrared spectrum. GRA

N84-10193# Universal Energy Systems, Inc., Dayton, Ohio.

SHARP PC-1500 POCKET COMPUTER SOLUTIONS TO COMPOSITE MATERIALS FORMULAS Final Technical Report, Jun. - Dec. 1982

Won J. Park and Thierry N. Massard (AFWAL, Wright-Patterson AFB, Ohio) Wright-Patterson AFB, Ohio AFWAL Dec. 1982 37 p

(Contract F33615-82-C-5001)

(AD-A130421; AFWAL-TR-83-4016) Avail: NTIS HC A03/MF A01 CSCL 11/4

This volume contains the description and instructions of the use of Sharp PC-1500 Pocket Computer for the key calculations of the stiffness and strength of symmetric laminated composites. Instant calculations can be made for practical use. The formulas and equation numbers used in the performed programming have been derived from a book entitled, Introduction to Composite Materials, co-authored by S. W. Tsai and H. T. Hahn, published by Technomic Publishing Company, Westport, CT, July 1980.

Author (GRA)

N84-10194# Virginia Polytechnic Inst. and State Univ., Blacksburg.

ADVANCED FATIGUE DAMAGE DEVELOPMENT IN GRAPHITE EPOXY LAMINATES Interim Technical Report, 1 Apr. 1981 - 1 Dec. 1982

Russell D. Jamison and Kenneth L. Reifsnider Wright-Patterson AFB, Ohio AFWAL Dec. 1982 234 p refs

(Contract F33615-81-K-3225; AF Proj. 2307)

(AD-A130190; AFWAL-TR-82-3103) Avail: NTIS HC A11/MF A01 CSCL 11/4

Results of an experimental investigation of damage development in T300/5208 graphite epoxy laminates subjected to tension-tension cyclic loading are reported. The concept of laminate stiffness reduction as a damage analogue is shown to be a valuable means of test control and damage interpretation. The relationship between stiffness and number of cycles is shown to be unique for each laminate type studied, each possessing three distinct stages, but markedly different among the laminate types. By using two complementary nondestructive evaluation (NDE) techniques, edge replication and penetrant-enhanced stereo X-ray radiography along with a method for deploying fatigue-damaged specimens, the stages of stiffness reduction were found to correspond variously to the predominance of matrix cracking or delamination or interactions of these matrix damage modes. A number of subordinate matrix damage modes including interior delamination, microcracking, and longitudinal splitting are identified with the matrix cracks which produce them. Author (GRA)

N84-10195# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.

TRANSVERSE SHEAR EFFECTS IN BIMODULAR COMPOSITE LAMINATES

C. W. Bert and F. Gordaninejad Apr. 1983 32 p refs

(Contract N00014-78-C-0647)

(AD-A130261; OU-AMNE-83-1; TR-32) Avail: NTIS HC A03/MF A01 CSCL 11/4

A closed-form solution for the Timoshenko-type shear correction coefficient (K2) governing the deflection of bimodular composite laminates in cylindrical bending is presented. The bending-stress distribution for a laminate constructed of bimodular materials (which have different elastic moduli in tension and compression) is used in the two dimensional equilibrium equation to obtain the transverse shear-stress distribution. This shear-stress distribution is used to obtain expressions for the shear correction coefficient (based on equivalent shear strain energy) and the maximum dimensionless transverse shear stress (Tau xz) max. Finally, the effects of the elastic-constant ratios on the neutral-surface location and shear correction coefficient for laminates consisting of either unimodular or bimodular materials are studied. GRA

N84-10196# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.

PROCEEDINGS OF THE 8TH ANNUAL MECHANICS OF COMPOSITES REVIEW

Lisa A. Wilson Apr. 1983 418 p refs Workshop held at Wright-Patterson AFB, Ohio, 5-7 Oct. 1982

(AF Proj. 2307)

(AD-A130750; AFWAL-TR-83-4005) Avail: NTIS HC A18/MF A01 CSCL 11/4

Contents: Postbuckling Behavior of Graphite-Epoxy Panels Loaded in Compression; Spectrum Fatigue Behavior of Postbuckled Shear Panels; Development of Analysis for Predicting Compression Fatigue Life and Residual Strength in Composites; Microbuckling Initiated Failure in Tough Resin Laminates; Summary of Impact Work in the Fatigue and Fracture Branch; Characterization of Interlaminar Fracture Toughness in Composite Materials; Superposition Method for Analysis of Free Edge Stresses; Mechanics of Delamination Under Compressive Loads; A Cumulative Damage Model for Advanced Composite Materials; Property Degradation Approach to Cumulative Damage Modeling of Advanced Composites; Fatigue Damage-Strength Relationships in Composite Laminates; Layup and Frequency Effects on Fatigue Life of Composites; Effect of Stress Ratio on Fatigue Life of Composites; High-Load Transfer Joints for Wing Structures; Design Methodology for Bonded-Bolted Composite Joints; Interply Layer Progressive Weakening Effects on Composite Structural Response; Research on Composite Materials for Structural Design; Imperfection Sensitivity of Fiber-Reinforced Composite Thin Cylinders; Research into the Design Technology of Advanced Composites; Nonlinear Transient Analysis of Composite Plates, and Improved Ceramic Fracture Behavior for High Temperature Turbine Applications.

GRA

N84-10197# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.

STRUCTURAL GRADIENT IN THE SILANE COUPLING AGENT LAYERS AND ITS INFLUENCE ON THE MECHANICAL AND PHYSICAL PROPERTIES OF COMPOSITES

Hatsuo Ishida 25 Jul. 1983 53 p refs

(Contract N00014-80-C-0533)

(AD-A130864; CWRU/DMS/TR-11) Avail: NTIS HC A04/MF A01 CSCL 11/4

Studies of the structural gradient within the silane coupling agent interphase are reviewed. Origins of the structural variation in the silane layers are discussed in terms of the silane treating solution and variations in the substrates. The solution pH, concentration, solvent, hydrolysis time and aging time are some of the important parameters identified. Consideration is given to the following categories; the first monolayer on the substrate, the tightly chemisorbed layers near the substrate, the loosely chemisorbed layers in the middle and finally the physisorbed silanes in

the outermost layers. The role of these regions in terms of the reinforcement mechanism of composites and the rheology of polymer melts is discussed. Complex formation of silanes with metallic substrates is briefly mentioned. Author (GRA)

N84-10198# Pennsylvania Univ., Philadelphia. Dept. of Chemical Engineering.
STRUCTURE AND PROPERTIES OF INTERCALATED GRAPHITE FIBER-POLYMER COMPOSITES Final Report
William C. Forsman 7 Jul. 1983 88 p refs
(Contract DAAG29-79-C-0208)
(AD-A130832; ARO-16432.1-MS) Avail: NTIS HC A05/MF A01 CSCL 11/4

There is a clear need for high-strength, lightweight composites with improved electrical conductivity. Composites fabricated from intercalated graphite fiber show promise in satisfying that need. This research focused on the chemical aspects of fiber intercalation, stability of intercalated fibers and their relation to the mechanical and electrical properties of their epoxy composites. Early work on this project helped pin down the mechanism of formation of so-called acceptor compounds of graphite as one of oxidation by election transfer to highly electrophylic species. We then established that, at least in the prototype graphite nitrate, neutral species could be removed under vacuum, and that these labile acid species must be removed before stable composites could be prepared from the intercalated fiber. In addition, we studied the kinetics of nitric acid intercalation of graphite fiber and powder and highly ordered pyrolytic graphite and offerred a proposed mechanism based on crystallite size. Epoxy composites were fabricated from graphite fiber intercalated with nitric acid. GRA

N84-10199# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
TRANSIENT HEAT FLOW ACROSS UNI-DIRECTIONAL FIBERS IN COMPOSITES Final Report, Jan. - Dec. 1982
Lit. S. Han and Moshen Bashizadeh-Fakhar Mar. 1983 92 p refs
(Contract F33615-79-C-3030; AF Proj. 2401)
(AD-A131052; AFWAL-TR-83-3018) Avail: NTIS HC A05/MF A01 CSCL 11/4

Transient heat flow in fibrous composites is important in determining the depth of heat penetration and temperature gradients near surface layers. A previous report dealt with heat flow parallel to the fiber axis. This research is concerned with heat flow perpendicular to the uni-directional fibers. Temperature responses under the condition of a constant surface heat load are calculated by a finite-difference approach. The rise of the composite surface temperature is governed by two bounding-limits (the effective bound and the matrix bound) depending on the time scale. A threshold time criterion is established in this research which is based on a heat penetration concept. Author (GRA)

N84-10200# Case Western Reserve Univ., Cleveland, Ohio.
QUALITY CONTROL AND NONDESTRUCTIVE EVALUATION TECHNIQUES FOR COMPOSITES. PART 2: PHYSIOCHEMICAL CHARACTERIZATION TECHNIQUES, A STATE-OF-THE-ART REVIEW Final Report, 5 Aug. 1982 - 4 Apr. 1983
Jack L. Koenig St. Louis, Mo. US Army Aviation Research and Development Command May 1983 85 p refs
(Contract DAAG29-81-D-0100)
(AD-A131038; USAAVRADCOM-TR-83-F-6; AMMRC-TR-83-24) Avail: NTIS HC A05/MF A01 CSCL 11/4

The physical, chemical, and ultimate mechanical properties of high performance glass fiber-reinforced composites are dependent on the degree of cure and structure of epoxy matrices. Therefore, a knowledge of the properties of composites to the extent of the reaction and optimizing the performance. Several methods have been developed to characterize and differential scanning calorimetry, dielectric analysis, and dynamical process during or after the fabrication of the cured epoxy matrices to justify reproducibility, reliability, and durability. In general, a combination of these methods are powerful techniques to analyze and control the quality of epoxy matrices in fiber-reinforced composites. The sensitivity, advantages, and selectivity of these techniques will be reviewed and discussed in this report. GRA

N84-10201# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
METHODS OF IMPROVING THE MATRIX DOMINATED PERFORMANCE OF COMPOSITE STRUCTURES: A TECHNICAL REVIEW Final Report
Ramon Garcia Jul. 1983 70 p refs
(WR02303001)
(AD-A131257; NADC-83058-60) Avail: NTIS HC A04/MF A01 CSCL 11/4

Contained herein is a discussion of methods of increasing the matrix dominated properties of two-phase, continuous fiber/polymer composite materials by the addition of a third phase. For example, a resultant composite exhibiting improved matrix dominated properties may consist of an epoxy matrix binding together both silicon carbide whiskers and continuous graphite fibers. The potential exists to hold the fiber volume content at a level of approximately 50 to 60 percent while displacing 5 to 15 percent of the epoxy with whiskers. The resultant fiber/whisker/epoxy composite has the potential to exhibit superior strength and stiffness to weight properties as compared to a fiber/epoxy composite. The distinct approaches are examined. The first approach utilizes the fibers as a carrier for the whiskers, or third phase. It is proposed that silicon carbide whiskers be grown directly on the surface of graphite fibers. These fibers can then be impregnated with the epoxy matrix. The second approach is to utilize the epoxy matrix as a carrier for the whiskers. Silicon carbide whiskers can be added to the epoxy prior to impregnation of the graphite fibers. GRA

N84-10202# Argonne National Lab., Ill. Materials Science and Technology Div.
IRRADIATION EFFECTS ON THE MECHANICAL PROPERTIES OF COMPOSITE ORGANIC INSULATORS
S. Egusa, M. A. Kirk, R. C. Birthcer, M. Hagiwara (Japan Atomic Energy Research Inst., Takasaki), and S. Kawanishi (Japan Atomic Energy Research Inst., Takasaki) 1983 25 p refs Presented at 2nd Intern. Conf. on Radiation Effects on Insulators, Albuquerque, N. Mex., 30 May 1983
(Contract W-31-109-eng-38)
(DE83-014703; CONF-830573-4) Avail: NTIS HC A02/MF A01

Four kinds of cloth-filled organic composites (filler: glass or carbon fiber; matrix: epoxy or polyimide resin) were irradiated with 2-MeV electrons at room temperature, and were examined with regard to the mechanical properties. Following irradiation, the Young's (tensile) modulus of these composites remains practically unchanged even after irradiation up to 15,000 Mrad. The shear modulus and the ultimate strength, on the other hand, begin to decrease after the absorbed dose reaches about 2000 Mrad for the glass/epoxy composite and about 5000 approx. 10,000 Mrad for the other composites. This result is ascribed to the decrease in the capacity of load transfer from the matrix to the fiber due to the radiation-induced debonding at the interface. As to the fracture behavior, the propagation energy increase from the beginning of irradiation. This result is attributed to the radiation-induced decrease in the bonding energy at the interface. The same study was made also for these composites and an alumina fiber-epoxy composite irradiated with fast neutrons at room temperature and 50 K. DOE

N84-10203# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CHARACTERIZATION, ANALYSIS AND SIGNIFICANCE OF DEFECTS IN COMPOSITE MATERIALS
Loughton, England Jul. 1983 309 p refs In ENGLISH and FRENCH Conf. held in London, 12-14 Apr. 1983
(AGARD-CP-355; ISBN-835-0333-3) Avail: NTIS HC A14/MF A01

The effects of damage and manufacturing defects on the structural properties of composite materials are addressed. The general characterization of these defects, their analysis by nondestructive evaluation, and fatigue and static testing are also

discussed. For individual titles, see N84-10204 through N84-10224.

N84-10204# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
FRACTOGRAPHIC ANALYSIS OF FAILURES IN CFRP
D. Purslow *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 11 p (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Work on unidirectional carbon fiber reinforced plastics (CFRP) test coupons in which a known mode of failure had been produced, the modes being longitudinal and transverse tension, compression and shear is discussed. From a fundamental understanding of the character of the different modes and of the mechanisms of fracture propagation it is shown how the qualitative significance of micro-defects occurring in good quality laminates may be assessed. The defects considered are fiber faults, fiber matrix bond strength, fiber distribution, fiber alignment and voids and inclusions; these are illustrated and their individual and collective significance discussed. M.G.

N84-10205# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
NDE TECHNIQUES FOR COMPOSITE LAMINATES
George P. Sendeckyj *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 22 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Destructive and nondestructive evaluation (NDE) techniques for documenting defects and damage in resin-matrix composite materials are described and assessed from the viewpoint of a researcher studying the damage accumulation process. The results show that deplying, a destructive evaluation technique, provides the most detailed information on the spatial distribution of damage in resin-matrix composite materials. Of the NDE techniques, penetrant enhanced stereo X-ray radiography is the best one. Ultrasonic, holographic, and edge replication NDE techniques provide much less information than X-ray radiography. Acoustic emission, thermographic and stiffness change monitoring provide valuable information on when to conduct more thorough evaluations using one of the other NE techniques. M.G.

N84-10206# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
MONITORING OF DEFECT PROGRESSION BY ACOUSTIC EMISSION
Joachim Block *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 11 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Acoustic emission (AE) is a suited technique for the characterizattion of damage in composite materials, as also in metallic structures. A lot of tests with different carbon fiber reinforced plastics (CFRP) specimens make sure that there are correlations between certain AE parameters, respectively their variation, and characteristics of defects, which are typical for composites. The damage history of the test specimens can be analyzed with a very good chronological resolution. This includes an exact correlation between acoustic and mechanical parameters, such as load, cycle number etc. The present results demonstrate a potential for distinguishing between some dominant failure mechanisms, as fiber failure and matrix cracking, and noise generated by internal friction. Locating existing defects and tracking spatial damage progression is another field of application. All AE data are being monitored continuously in situ during loading of the specimen. Post-test-analysis of the stored data with suited computer programs enables a more sophisticated evaluation. M.G.

N84-10207# Societe Europeene de Propulsion, Saint-Medard-en-Jalles (France). Div. Propulsion a Poudre et Composites.
DISSECTING COMPOSITE PARTS: A VALUABLE AID IN CONCEPT DESIGN AND NONDESTRUCTIVE CONTROL [LA DISSECTION DES COMPOSITE: UNE AIDE PRECIEUSE A LA CONCEPTION ET AU CONTROLE NON DESTRUCTIF]
M. Bourgeon *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 2 p In FRENCH (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Specific examples are given to demonstrate the importance that must be given to dissecting parts made of composite materials. Such dissection is helpful in concept definition by bringing complementary information by calculations of fiber orientation and quality of functional liaisons etc., and in nondestructive control by real signification of flaws evidenced by different techniques and the effect this can have on the choice of methods.
Transl. by A.R.H.

N84-10208# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
GROWTH OF DELAMINATIONS UNDER FATIGUE LOADING
R. Prinz *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 27 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

In order to determine the nature of failure mechanisms a number of fatigue tests were performed. The test specimens partly have artificial delaminations between different layers of the multidirectional laminates made from T300/914C prepregs. For better understanding of the strength degradation in fatigue a damage model, based on the delamination propagation, starting from the free edges between the plies of a multidirectional laminate, was developed. These defects propagate due to interlaminar stresses up to an area, which is critical in the case of tension-compression fatigue against buckling or shearing of parts of the delaminated test specimen. Author

N84-10209# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
EXPERIMENTAL INVESTIGATION OF DELAMINATIONS IN CARBON FIBRE COMPOSITE
W. Geier, J. Vilsmeier, and D. Weisgerber *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 11 p (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Results concerning the effect of delaminations on static and fatigue strength of carbon fiber composites are presented. The delaminations were introduced artificially into solid laminates and sandwich structures by means of folded teflon patches. The effects of delaminations caused by low energy impact were also investigated. The tests were carried out both at room temperature and at 120 C in the as received as well as in the wet condition. For the sandwich structure design no loss in fracture strength could be found even in the case of fatigue and built-in delaminations. The same results are valid for the shear angle specimens. No significant loss in compression strength caused by 6 x 6 mm delaminations was found, although 12 x 12 and 12 x 25 mm delaminations showed a considerable reduction in strength. The effect of delaminations caused by low energy impact was found to be no greater than that of a 6 mm open hole. M.G.

N84-10210# Army Materials and Mechanics Research Center, Watertown, Mass.
CHARACTERIZATION OF CUMULATIVE DAMAGE IN COMPOSITES DURING SERVICE
M. E. Roylance, W. W. Houghton, G. E. Foley, R. J. Shuford, and G. R. Thomas *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 14 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

The nature of cumulative damage occurring in glass epoxy composite test coupons and sub-structures during fatigue loading was investigated and the extent of this damage was correlated with remaining useful lifetime. Changes of stiffness in composite

laminate specimens loaded in tension-tension fatigue at various load levels were shown to reflect the extent of accumulated damage and the magnitude of the stiffness change was used to predict the remaining life fraction of the specimens. Dynamic structural analysis techniques can be used to follow these stiffness changes in substructures, and should be useful as a field technique for following stiffness losses in composite structures. The nature of the damage which occurs during fatigue loading was characterized by a number of nondestructive evaluation techniques including ultrasonics and infrared thermography. M.G.

N84-10211# Westland Helicopters Ltd., Yeovil (England). Materials Lab.

AN EMPIRICAL APPRAISAL OF DEFECTS IN COMPOSITES

Nigel Parslow *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 18 p (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

The development of a helicopter tail rotor blade from fiber reinforced materials is discussed. Rotor blades were manufactured from pre-preg material in the form of uni-directional glass fiber, uni-directional carbon fiber, and woven glass fabric (two weave styles) all impregnated with epoxy resin. An expanding mandrel technique was used to manufacture the tail rotor blade. All the development blades were subjected to a non-destructive evaluation to develop a technique capable of assessing the size and location of defects in the component, while maintaining a degree of convenience to ensure rapid inspection of the component. During the development of the tail rotor blade, various defects and discontinuities were produced. These are categorized and discussed in reference to their effect on blade performance. M.G.

N84-10212# Aeritalia S.p.A., Torino (Italy). Materials Technology Research.

CORRECTION BETWEEN NONDESTRUCTIVE INSPECTION RESULTS AND PERFORMANCE OF GRAPHITE/EPOXY STRUCTURAL PARTS

Franco Cipri *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 7 p (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

During production of advanced composite structural parts, because of material or manufacturing process anomalies, some typical defects, such as porosity and/or delaminations, may become embodied into the final product. In order to improve the accept/reject criteria for typical defects, a static/fatigue test program was on specimens in which various porosity levels were simulated. Further, an attempt was made to correlate mechanical performances with the ultrasonic energy absorption measures. M.G.

N84-10213# Royal Aircraft Establishment, Farnborough (England). Materials Structures Dept.

THE EFFECT OF DAMAGE ON THE TENSILE AND COMPRESSIVE PERFORMANCE OF CARBON FIBRE LAMINATES

Sarah M. Bishop and Graham Dorey *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 10 p refs (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

The type of defect or flaw produced when carbon fiber reinforced plastics (CFRP) is damaged in service depends on the structural design and the conditions of damage such as the energy and momentum of an impact. These defects are stress raisers which may reduce the strength of the structure. There is a need, following non-destructive inspection, to be able to predict the residual performance so that decisions can be made on whether to monitor, repair or replace the component. Various types of damage produced by typical impact situations were assessed non-destructively and the effect on strength determined in tension and compression under both static and fatigue loading. For example areas of delamination, shown by sectioning to be multiple delamination between the plies, reduce the compressive strength by local buckling processes. Detailed examination of the fracture mechanisms at machined notches emphasizes the importance of effects in neighboring plies influencing the stress concentrations in the load carrying 0 deg fibers. M.G.

N84-10214# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Bauweisen- und Konstruktionsforschung.

BEHAVIOR OF IDEALIZED DISCONTINUITIES AND IMPACT DAMAGES IN CFRP UNDER FATIGUE LOADING

R. M. Aoki *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 10 p refs (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

Results of an ongoing experimental program concerning the behavior of impact damaged carbon fiber reinforced plastic (CFRP) specimens are presented. The purpose is to determine the characteristics resulting from localized low-energy impact damage and also the behavior of the damaged specimens under harmonic fatigue loading. Damage simulating a dropped medium weight (300 g) tool was introduced by drop weights with various geometry impactors. Also circular defects were built into specimens as idealized discontinuities. The damage propagation under static and fatigue loading ($R = 0.1$, $R = -1$) was monitored using US-C-scan, temperature measurements and acoustic emission. The basic parameters included the influence of stacking sequence and impactor tip radius, as well as the degree of local discontinuity in the outer layers of the specimens. The straight sided specimens with quasi-isotropic lay-up are manufactured from T300/Code 69. The feasibility of simulating impact damages with this form of built-in idealized discontinuities is shown. M.G.

N84-10215# Societe Nationale Industrielle Aerospatiale, Suresnes (France).

THE INFLUENCE OF FABRICATION FLOWS ON THE STATIC AND DYNAMIC BEHAVIOR OF STRUCTURES MADE OF CARBON-RESIN COMPOSITES [INFLUENCE DE DEFAUTS DE FABRICATION SUR LE COMPORTEMENT STATIQUE ET DYNAMIQUE DES STRUCTURES EN COMPOSITE CARBON-RESINE]

J. Cuny and G. Briens *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 9 p In FRENCH (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

The types of flaws appearing in the fabrication of carbon-resin composites are examined as well as methods adopted for their detection. The influence of defects affecting only the resin or the fiber-resin interface are studied. Emphasis is on high resistance carbon fibers impregnated with epoxy resins. Transl. by A.R.H.

N84-10216# Costruzioni Aeronautiche Giovanni Agusta S.p.A., Gallarate (Italy). Technological Development Dept.

ADVANCED ND TECHNIQUES FOR COMPOSITE PRIMARY STRUCTURES

M. Farioli, F. Porro, G. Samanni, and V. Wagner *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 18 p refs (For primary document see N84-10203 01-24)

Avail: NTIS HC A14/MF A01

One of the weakest points in composites and adhesives technology is that there is no one N.D. method useful and valid for all kinds of defects. A variety of N.D. methods is needed in order to achieve good results in the inspectability of configurations. Some of the most popular techniques for maximum sensitivity determination of standard defects using proof specimen are reviewed. These include X-ray radiography and in-line radioscopy electronically supported; X-ray xeroradiography; neutron radiography; and U.S. investigation methods. The application of these techniques and results obtained on the main rotor spar and blade main rotor blade grip are discussed. A.R.H.

N84-10217# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

COMPUTATION OF INFLUENCE OF DEFECTS ON STATIC AND FATIGUE STRENGTH OF COMPOSITES

R. C. Tennyson, J. S. Hansen, G. R. Heppler, G. Mabson (Engineering Research Associates, Toronto, Ontario), G. Wharram (Engineering Research Associates, Toronto, Ontario), and K. N. Street (Defence Research Establishment Pacific, Victoria, B.C.) *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 17 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

A combined analytical and experimental investigation has been undertaken to determine the effects of flaws on the static strength and fatigue life of graphite/epoxy (AS1/3501-6) laminates. Both bond-line defects in sandwich beam construction and interlaminar disbond flaws were studied. Up to present, compressive strength test data were obtained from ambient and elevated temperature, moisture-saturated conditions, including results from thermal-spike cycling simulating supersonic flight. In addition, baseline data were obtained to define the strength parameters associated with the tensor polynomial lamina failure criterion. Although this model was originally derived for static 'unflawed' strength predictions, it is being extended to include the effect of holes and flaws. In the latter case, a finite element approach is described to illustrate the methodology for computing the influence of flaws. A formulation for predicting the fatigue life of laminates is presented based on the experimental evaluation of fatigue functions which are utilized in a form of the tensor polynomial failure criterion. Author

N84-10218# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering.
FRACTURE MECHANICS OF SUBLAMINATE CRACKS IN COMPOSITE LAMINATES
A. S. D. Wang *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 19 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

An overview is presented of a fracture mechanics approach to some of the most frequently encountered matrix dominated, sub laminate cracks in epoxy based composite laminates. By "sub-laminate", it is meant that the cracks are internal to the laminate, generally invisible macroscopically; but are much larger in size than those microcracks considered in the realm of micromechanics. The origin of sub-laminate cracks is assumed to stem from the coalescence of natural material flaws (also microcracks) which occur under a certain favorable laminate stress condition. Thus, the modelling of the mechanisms of sub-laminate crack initiation and propagation is essentially mechanistic and probabilistic in nature. Some specific results from several analytical/experimental investigations using graphite-epoxy laminates are presented and discussed. Author

N84-10219# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
THE SIGNIFICANCE OF DEFECTS AND DAMAGE IN COMPOSITE STRUCTURES
R. T. Potter *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 10 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

The significance of defects and damage in fiber composite structures depends upon a wide range of decisions taken at every stage of the life of each particular structure, from the initial design conception, through detailed design and manufacture, to inspection, maintenance and repair procedures. Since many of these decisions interact, there is a need for a coherent overall philosophy for the management of defects and damage if fiber composite structures are to be efficient and cost effective. The general requirements of such a philosophy are considered and it is seen that further research is required particularly on the interaction of defects and damage with structural features. Some initial results and observations from the RAE program devised to study such interactions are presented. Author

N84-10220# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
IN-SERVICE NDI OF COMPOSITE STRUCTURES: AN ASSESSMENT OF CURRENT REQUIREMENTS AND CAPABILITIES
D. E. W. Stone and B. Clarke *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 14 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Practical design criteria and the structural significance of defects and damage in carbon fiber composite components are reviewed. The principal sources of in-service damage and the possibility of the interaction of damage mechanisms are considered. The concept of providing a map of damage acceptability for a given structure is then discussed. The probable current requirements for in-service NDI are assessed. The capabilities and limitations of currently available NDI techniques are reviewed, and some recent developments are described. Author

N84-10221# McDonnell Aircraft Co., St. Louis, Mo.
EFFECT OF DEFECTS ON AIRCRAFT COMPOSITE STRUCTURES
R. A. Garrett *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 34 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Seven manufacturing defects associated with mechanical fasteners for aircraft composite structures were investigated; out-of-round holes; broken fibers on the exit side of drilled holes; porosity; improper fastener seating depth; tilted countersinks; interference fit; and multiple fastener installation and removal cycles. Both static and fatigue test results are described, along with correlation with analysis techniques. The interaction of the effects of these defects on hole wear, measured in fatigue tests of structural joints, is considered. The effects of two types of service-induced damage are also described; low energy impact damage and 23mm HEI ballistic damage. The relative sizes of visible and non-visible damage as determined by visual and non-destructive inspection techniques are compared. Stitching and the inclusion of glass or Kevlar fiber buffer strips to improve the damage tolerance of carbon/epoxy structures are evaluated. Results of tests of carbon/epoxy panel structures are discussed. Correlation of experimental results with predicted residual static strength is good. Author

N84-10222# General Dynamics Corp., Fort Worth, Tex.
THE ENGINEERING SIGNIFICANCE OF DEFECTS IN COMPOSITE STRUCTURES
D. J. Wilkins *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 11 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

The significance of defects in composite aircraft structures is described from a broad, practical viewpoint. Three generic defect types (cut fibers, matrix cracks, and delaminations) and simple load components that can be generalized to the most complex loading cases are considered. Methods for evaluating manufacturing and in-service damage in terms of the resulting local damage are reviewed and the possible benefits of more damage tolerant forms of composite materials are explored. Author

N84-10223# British Aerospace Public Ltd. Co., Preston (England). Aircraft Group.
DEFECT OCCURRENCES IN THE MANUFACTURE OF LARGE CFC STRUCTURES AND WORK ASSOCIATED WITH DEFECTS, DAMAGE AND REPAIR OF CFC COMPONENTS
C. S. Frame and G. Jackson *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 17 p (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

Current activities in a research investigation into the effects of defects and damage, and their repair, are reviewed. Future work in this field is also discussed. The occurrences of defects and damage in large CFC structures (eg. Tornado taileron, Jaguar wing etc) are presented and experience gained from flight and ground testing is reported. The NDT detection and characterization

methods are given together with an outline of the work proposed to overcome existing problem areas and limitations. Author

N84-10224# Rockwell International Corp., Los Angeles, Calif.
DELAMINATION GROWTH IN COMPOSITE STRUCTURES UNDER INPLANE COMPRESSION LOADING
Don Y. Konishi *In* AGARD Characterization, Anal. and Significance of Defects in Composite Mater. Jul. 1983 10 p refs (For primary document see N84-10203 01-24)
Avail: NTIS HC A14/MF A01

An approximate solution to the stress field causing delamination under biaxial loading, where the principal load is compressive, was developed. It utilizes a Raleigh-Ritz approach for the finite amplitude deflection analysis of a rectangular or elliptical plate which has bending/membrane coupling terms and clamped boundary conditions. The solution determines the complete stress field on the boundary, including the short transverse stress field. This leads to delamination growth trajectories which can be analyzed to determine constant gradient da/dt growth configurations. These results can be analyzed to establish design criteria to be used to minimize the impact of delamination growth considerations by stacking sequence selection, etc., as well as to maximize the residual strength capabilities of the structure. Author

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-10225# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
METHOD OF PRODUCTION OF NITROPHOSPHATES
V. P. Panov, L. Ja. Terescenko, I. I. Orehov, and L. Ja. Smirnova 1982 7 p refs Transl. into ENGLISH of Sposob Polucenija Nitrofosfatov (USSR), (Author's Cert. 802246), KS/QB, Nov. 1982 (CSIR-Trans-1689; USSR-AC-802246) Avail: NTIS HC A02/MF A01

The production of a complex mineral fertilizer which is used in the production of concentrated fertilizers based on natural phosphates decomposed by nitric acid is discussed. The production of complex concentrated fertilizers based on phosphates decomposed by nitric acid is carried out in two basic stages: decomposition of the raw material by nitric acid and removal of the excess calcium from the nitric acid extract. A shortcoming is the fact that the separation of the excess calcium is accompanied by thermal losses, as the process is carried out at 18 to 0 C. The method closest to the invention to be the process of producing complex fertilizers by decomposition of natural phosphates by means of a mixture of solutions of nitric acid in water and in tributyl phosphate (TBP) with a 58 to 64% (m/m) HNO3/HNO3 + H2O concentration in the solution; this yields a concentrated extract based on normal nitric acid. The subsequent separation of the excess calcium nitrate is carried out by cooling the solution to 10 to 20 C. Author

N84-10226# British Library Lending Div., Boston Spa (England).
SPECIAL FEATURES OF ELECTROCHEMICAL DETERMINATION OF NON-UNIFORMLY DISTRIBUTED OXYGEN IN MELTS
A. A. Ivanov, I. V. Zinkovskii, V. P. Luzgin, V. P. Chepelev, and I. V. Apryatkin [1982] 8 p refs Transl. into ENGLISH of Izv. VUZ Chem. Metall. (USSR), v. 9, 1982 p 1-4
(BLL-M-35105-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Errors in the e.m.f. method of determining oxygen activity in molten metal are considered, especially those due to differences in oxygen activity along the transducer (solid-electrolyte probe). The e.m.f. generated by the transducer corresponds to some 'effective' value that differs from the average oxygen activity in the melt and is determined to a considerable extent by the law of oxygen distribution down the metal. An equation is obtained that connects oxygen activity as calculated from the e.m.f. value of the transducer with the oxygen activity actually existing in the metal when the oxygen is distributed nonuniformly. Author

N84-10227# British Library Lending Div., Boston Spa (England).
CHEMICAL AND ELECTROCHEMICAL PROPERTIES IN MOLTEN ALKALINE HYDROXIDES. 2: OXIDISING/REDUCING REACTIONS OF OXYGEN
Jean Goret and Bernard Tremillon 5 Jul. 1983 17 p refs Transl. into ENGLISH of Bull. Soc. Chim. Fr. Memoires Presentes a la Soc. Chim. (Paris)
(BLL-Risley-TR-4775-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Electrochemical study showed that four different degrees of oxidation of oxygen could exist in solution in molten alkaline hydroxides: free oxide ions, (-2) (and as a complex in OH) (-); peroxide ions, 0 (2-); superoxide ions, 02 (-); and dissolved oxygen (extremely small solubility). The oxide ion 0 (2-), the strongest base in molten alkaline hydroxides, is reducing. It can be oxidized to peroxide, then to superoxide. Author

N84-10228# United Kingdom Atomic Energy Authority, Risley (England).
NO. 263 CHEMICAL AND ELECTROCHEMICAL PROPERTIES IN MOLTEN ALKALINE HYDROXIDES. 11: POTENTIAL-ACIDITY DIAGRAM FOR IRON IN MOLTEN SODIUM HYDROXIDE AT 350 DEG C
Richard G. Doisneau (Paris VI Univ., France) and Bernard Tremillon (Paris VI Univ., France) [1982] 14 p refs Transl. into ENGLISH from Bull. Soc. Chem. Fr. (France), v. 9-10, Pt. 1, 1976 p 1419-1424
(BLL-Risley-TR-4761-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The chemical properties of iron and its compounds in molten hydroxides (sodium hydroxide in particular) were, for a long time, the object of numerous studies. But the information concerning these properties remains incomplete because, above all, the concepts of acidity-basicity and oxidation-reduction were not considered. A reasoned and rational utilization of experimental data is needed. Within the framework of electrochemical studies undertaken in our laboratory in order to determine and express, in an analytical form, properties in molten hydroxides, the case of iron, an element of considerable practical importance was considered. Basing our argument on properties which are already known and on thermochemical data we established a potential acidity diagram of iron in NaOH at 350 C. Next, by using an experimental electrochemical study, a fuller understanding was obtained, and, as a result, established a more precise potential acidity diagram. Author

N84-10229# British Gas Corp., London (England).
DETERMINING THE HOMOMORPHILS OF POLAR SUBSTANCES BY GAS-LIQUID CHROMATOGRAPHY
Minodora Leca, Mariana Surmeian, and Lidia Groswalk-Cremer 15 Aug. 1983 13 p refs Transl. into ENGLISH from Rev. de Chimie (Romania), v. 30, no. 2, 1979 p 172-175
(BLL-T6164/BG/LRS-(9022.048); LRST655/83) Avail: British Library Lending Div., Boston Spa, Engl.

A new method was developed for determining the homomorphils of organic solvents, using chromatographic retention data of squalene as the stationary phase. The method is rapid and highly accurate, and enables the non-polar solubility parameters determined from the homomorphism graphs to be corrected. Author

N84-10230# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
INVESTIGATION OF COHERENT ANTI-STOKES RAMAN SCATTERING MEASUREMENTS IN CARBON ABLATION EXPERIMENTS
R. C. Benson and H. Y. Chiu May 1983 16 p refs
(Contract N00024-83-C-5301)

(AD-A130578; JHU/APL/TG-1341) Avail: NTIS HC A02/MF A01 CSCL 07/4

Investigations were made of the feasibility of using Raman techniques to measure the gaseous products of carbon oxidation. A coherent anti-Stokes Raman scattering system was assembled to measure carbon monoxide. Approximately 200 micrometer from the graphite surface, carbon monoxide concentrations in the range of 5 to 10% (40 to 80 Torr) were measured during the ablation of ATJ graphite in air at 2000 K. Recommendations were made for improvements to the experimental system. Author (GRA)

N84-10231# Brown Univ., Providence, R. I. Dept. of Chemistry.
RAMAN STUDIES OF CuTCNQ: RESONANCE RAMAN SPECTRAL OBSERVATIONS AND CALCULATIONS FOR TCNQ ION-RADICALS
Efstratios I. Kamitsos and William M. Risen, Jr. 7 Jul. 1983 49 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-75-C-0883; NR Proj. 051-539)
(AD-A130570; TR-83-06) Avail: NTIS HC A03/MF A01 CSCL 07/4

The Raman spectra of thin film, and powered crystalline forms of CuTCNQ have been studied and analyzed in connection with their electronic spectra, and vibrational normal coordinate analysis and molecular orbital results. Non-resonance and resonance Raman conditions have been obtained by using different sample form and source wavelengths. Shifts of TCNQ and TCNQ vibrational frequencies from those of TCNQ(o) due to changes in the charge on the TCNQ moiety have been calculated in terms of molecular orbital parameters and TCNQ(o) vibrational frequencies. The resonance Raman enhancement of TCNQ(-) in the red band system is shown to be of Franck-Condon origin and its resonance Raman spectrum in this region is calculated. Transformation of CuTCNQ to TCNQ(o) with different laser lines is explained on the basis of photoinduced electronic transitions. Author (GRA)

N84-10232# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
IGNITION DELAY TIMES OF PROPENE OXYGEN ARGON MIXTURES
Alexander Burcat and Josef Levitas Mar. 1983 20 p refs
(AD-A130464; TAE-503) Avail: NTIS HC A02/MF A01 CSCL 07/3

The ignition times of Propene Oxygen Argon mixtures were measured in a shock tube. The concentrations ranged from 0.6% to 1.6% C3H6 and 2.7% to 14.4% oxygen. The initial pressures were 50 to 133 torr, and the temperatures achieved were 1274-1848 K. The overall ignition delay equation for Propene Oxygen Argon mixtures has a value of tau = 5.3 x 10 to the minus 14th power exp((37.5 x 10 to 3rd power)/RT)(C3H6) 0.23 (O2) -1.12 (Ar)0 sec. A kinetic scheme for the oxidation of propene is proposed. GRA

N84-10233# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
INVESTIGATION OF THE ELECTROCHEMICAL FORMATION OF LI-C INTERCALATION COMPOUNDS Final Report, 1982
Patricia H. Smith, Larry DeVries, Jason N. Shih, Stanley D. James, and William P. Kilroy May 1983 28 p refs
(AD-A130879; AD-F500172; NSWC/TR-83-30) Avail: NTIS HC A03/MF A01 CSCL 07/4

This investigation re-examines the possible undervoltage electrochemical formulation of Li-C intercalation compounds. The conditions simulated that of a cell which has failed due to depolarizer starvation. Carbon black cathodes were subjected to constant-current electrolysis in 1 M LiAsF solutions in propylene carbonate or 2-methyltetrahydrofuran. Cathode V-t curves displayed plateaus around + 1 V versus Li in which the cathode absorbed approximately 16 coulombs per sq cm before falling to 0.05 V where the runs were terminated. Aqueous extracts of the cathodes contained little or no hydroxide indicating the absence of Li-C compounds. However, the present work also showed that LiC6 rapidly reduces propylene carbonate to carbonate ion. Hence it remains possible that the undervoltage plateaus originated in the formation of intermediate Li-C compounds which rapidly reduce the solvent. GRA

N84-10234# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
HYDROTHERMAL STABILITY OF GAMMA-AMINOPROPYLTRIETHOXYSILANE COUPLING AGENT ON GROUND SILICON POWDER AND E-GLASS FIBERS
S. R. Culler, H. Ishida, and J. L. Koenig 21 Jul. 1983 27 p refs Submitted for publication
(Contract N00014-80-C-0533; NR Proj. 356-739)
(AD-A130904; CWRU/DMS/TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/3

Diffuse reflectance Fourier transform infrared spectroscopy (Drift) was used to study the hydrothermal stability of silane coupling agents on the surface of E-glass fibers and ground silicon powder. The coupling agent studied was gamma-aminopropyltriethoxysilane (gamma-APS). The concepts of chemisorbed and physisorbed silane coupling agent were explored using the Drift infrared technique. The ground silicon powder was used to model the E-glass fiber/coupling agent system. Using the silicon powder, the structure of the siloxane (Si-O-Si) region of the infrared spectrum (1150 to 1000/cm-1) could be investigated. Water was used to remove the physisorbed coupling agent from the substrate. The amount of chemisorbed silane was found to vary slightly as a function of the coupling agent concentration, heat treatment, pH of the coupling agent on the substrate, and the temperature of the water used to remove the physisorbed coupling agent. Spectroscopic evidence was found for chemical bonding of the chemisorbed silane coupling agents to the surface of the substrate used. GRA

N84-10235# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ATOMIC PHOTOELECTRON-SPECTROSCOPY STUDIES USING SYNCHROTRON RADIATION Ph.D. Thesis
P. H. Kobrin Feb. 1983 206 p refs
(Contract DE-AC03-76SF-00098)
(DE83-011740; LBL-15591) Avail: NTIS HC A10/MF A01

Photoelectron spectroscopy combined with tunable synchrotron radiation was used to study the photoionization process in several atomic systems. The time structure of the synchrotron radiation source at the Stanford Synchrotron Radiation Laboratory (SSRL) was used to record time of flight (TOF) photoelectron spectra of gaseous Cd, Hg, Ne, Ar, Ba, and Mn. The use of two TOF analyzers made possible the measurement of photoelectron angular distributions as well as branching ratios and partial cross sections. DOE

N84-10236# California Univ., Livermore. Lawrence Livermore Lab.
DATA ANALYSIS OF THE LLNL HYDROGEN IGNITER EXPERIMENTS
T. J. Altenbach, B. W. Davis, R. W. Martin, and T. A. Reitter Feb. 1983 63 p refs
(Contract W-7405-eng-48)
(DE83-010260; NUREG/CR-3225; UCRL-53049) Avail: NTIS HC A04/MF A01

A data analysis of the Lawrence Livermore National Laboratory (LLNL) Hydrogen Igniter Experimental Program is presented in this report. This work was funded by the Nuclear Regulatory Commission (NRC) Office of Nuclear Reactor Regulation under the Containment Hydrogen Analysis Project (FIN A0422). The general analysis includes a comparison of available results from the LLNL, Fenwal, and Electric Power Research Institute (EPRI) igniter test programs and an analysis of flame speeds from the LLNL data. The treatment of the LLNL steam tests includes the development of a model to calculate mass condensation rates and maximum fog density, and the application of this model to the steam test data with the goal of explaining the various hydrogen burn phenomena observed. DOE

N84-10237# Oak Ridge National Lab., Tenn. Chemistry Div.
COMPOSITION GRADIENTS IN ELECTROLYZED LICI-KCI MELTS

C. E. Vallet, D. E. Heatherly, and J. Braunstein 1983 21 p refs Presented at the Spring Meeting of the Electrochem. Soc., Montreal, 9-14 May 1982
(Contract W-7405-eng-26)
(DE83-012347; CONF-820508-12) Avail: NTIS HC A02/MF A01

Analysis of transport in a mixed electrolyte has previously predicted significant composition gradients in the LiCl-KCl electrolyte of high-temperature Li/S batteries. Composition gradients in quenched electrolyzed LiCl-KCl eutectic are measured with high distance resolution by scanning electron microscopy with energy-dispersive X-ray spectroscopy. The reported results include compositions of LiCl-KCl contained in a porous Y2O3 matrix and electrolyzed between two solid Li/Al electrodes, and of the electrolyte in the pores of a powdered Li/Al electrode. The results provide quantitative measurements of the composition in the electrolyte, and demonstrate precipitation of LiCl in the porous anode. DOE

N84-10238# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
POSITRON SPECTROSCOPY APPLIED TO THE ANALYSIS OF SURFACES
L. D. Hulett, J. M. Dale, S. Pendyala (State Univ. of New York, Fredonia), Y. K. Chang, and W. S. Lyon 1982 9 p refs
(Contract W-7405-eng-26)
(DE82-008836; CONF-820335-1) Avail: NTIS HC 02/MF A01

The interaction with solid material of positrons emitted from radioactive sources has been studied for many years, but applications to surface analyses have been rather limited. Positrons from sources such as (58)Co and (22)Na have energies ranging as high as 450-550 keV; thus they penetrate deep inside the solids before being reduced to energies convenient for surface spectroscopies. Also, since the energy distributions are continuous, it is impossible to make the necessary high resolution energy loss measurements for such things as element identification. Recently some new techniques for generating monoenergetic positrons have been developed which eliminate some of these problems, and new surface spectroscopies are being investigated. In this paper accomplishments at ORNL over recent years and prognosis of future applications such as high energy positron diffraction are presented. DOE

N84-10239# Rochester Univ., N. Y. Dept. of Chemistry.
RESONANCE FLUORESCENCE OF MANY INTERACTING ADATOMS AT A METAL SURFACE
Xi-Yi Huang, Thomas F. George, and Jui-Teng Lin Jun. 1983 15 p refs
(Contract N00014-80-C-0472)
(AD-A129866; UROCHESTER/DC/83/TR-34) Avail: NTIS HC A02/MF A01 CSCL 07/4

A model of resonance fluorescence of a laser-driven two-level atom near a metal surface is reviewed, and results are shown in the weak-field limit for the population inversion and the power spectrum. Extension of the model to interacting adatoms is discussed in terms of phonon-induced level broadening and adatom migration. Author (GRA)

N84-10240# Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
SEPARATION AS ASPHALTENES USING HIGH-RESOLUTION SUPERCRITICAL-FLUID CHROMATOGRAPHY Progress Report, 1 Mar. - 31 May 1983
W. P. Jackson, J. C. Fjeldsted, B. E. Richter, R. C. Kong, J. L. Kuei, and M. L. Lee 1983 7 p refs
(Contract DE-FG22-81PC-40809)
Avail: NTIS HC A02/MF A01

This project is designed to investigate and develop the techniques and instrumentation necessary to render capillary supercritical fluid chromatography (SFC) a viable high resolution method of analysis. The specific focus of this particular project is the application of SFC to high-molecular-weight coal-derived products, specifically asphaltenes. Recent results with capillary SFC indicate this technique can offer resolution approaching that of capillary GC and still achieve solvation of large compounds, such as the asphaltenes, which are not volatile enough to be analyzed by GC. The scanning fluorescence SFC system was examined more comprehensively to determine its potential in applications to complex separations. The FID/NPD SFC system was applied to several different samples of high molecular weight and/or thermally labile compounds. Several different stationary phases and crosslinking agents were examined for their role in column stability, selectivity, and activity. The examination of static coating of narrow bore columns was pursued. Elevated temperatures and mixed solvents were used to decrease the coating time for columns less than 100 (SIGMA)m ID. DOE

N84-10241# Sandia Labs., Albuquerque, N. Mex.
EFFECTS OF SOLVENT AND SUPPORTING ELECTROLYTE ON THE ELECTROCHEMICAL REDUCTION OF SULFUR DIOXIDE
Richard V. Whiteley, Jr. May 1983 69 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013436; SAND-83-0384) Avail: NTIS HC A04/MF A01

The electrochemical reduction of sulfur dioxide at a carbon cathode is of considerable interest because of its application in the high energy density, lithium/sulfur dioxide battery. This battery uses a lithium bromide supporting electrolyte in acetonitrile with a carbon cathode. The role of the solvent and supporting electrolyte in the electrochemical reduction of SO2 at a glassy carbon electrode was investigated by using two solvents and various supporting electrolytes. A 0.25 M solution of LiBr in acetonitrile was used to simulate the Li/SO2 battery electrolyte. The reduction reaction proceeds by a one electron charge transfer which is essentially reversible (extremely fast) with little influence from either the solvent or supporting electrolyte. The reduction product, SO2(+), is rapidly consumed in a chemical reaction. This radical anion may be complexed by free SO2 to form the S2O4(+) adduct, or it may undergo a dimerization to form the S204(2+) (dithionite) ion. The mechanism of this follow-on reaction can be directed by the solvent and both the anion and cation of the supporting electrolyte. DOE

N84-10242# Argonne National Lab., Ill. Chemical Technology Div.
PRELIMINARY STUDY OF THE ELECTROLYSIS OF ALUMINUM SULFIDE IN MOLTEN SALTS
Nguyen Quang Minh, Raouf O. Loutfy, and Neng-Ping Yao Feb. 1983 75 p refs
(Contract W-31-109-eng-38)
(DE83-014552; ANL/OEPM-83-3) Avail: NTIS HC A04/MF A01

A preliminary laboratory-scale study of the electrolysis of aluminum sulfide in molten salts investigated the (1) solubility of Al2S3 in molten salts, (2) electrochemical behavior of Al2S3, and (3) electrolysis of Al2S3 with the determination of current efficiency as a function of current density. The solubility measurements show that MgCl2-NaCl-KCl eutectic electrolyte at 1023 K can dissolve up to 3.3 mol % sulfide. The molar ratio of sulfur to aluminum in the eutectic is about one, which suggests that some sulfur remains undissolved, probably in the form of MgS. The experimental data and thermodynamic calculations suggest that Al2S3 dissolves in the eutectic to form AlS( ) species in solution. Addition of AlCl3 to the eutectic enhances the solubility of Al2S3; the solubility increases with increasing AlCl3 concentration. The electrode reaction mechanism for the electrolysis of Al2S3 was elucidated by using linear sweep voltammetry. The cathodic reduction of aluminum-ion-containing species to aluminum proceeds by a reversible, diffusion-controlled, three-electron reaction. DOE

N84-10243# Argonne National Lab., Ill.
SEARCH FOR DOUBLY-CHARGED NEGATIVE IONS VIA ACCELERATOR MASS SPECTROMETRY
Walter Kutschera, Dieter Frekers, Richard Pardo, Karl E. Rehm, Robert K. Smither, and Jan L. Yatema 1983 14 p refs Presented at the 6th Intern. Tandem Conf., Chester, Engl., 16 Apr. 1983
(Contract W-31-109-eng-38)
(DE83-014321; CONF-8304105-2) Avail: NTIS HC A02/MF A01

The Argonne FN tandem accelerator in conjunction with an Enge split-pole magnetic spectrograph was used as a highly sensitive mass spectrometer to search for doubly charged negative ions of B(11), C(12) and O(16). No evidence for the formation of these ions in an inverted sputter source and the subsequent acceleration in the tandem was found. The following limits for the ratio of doubly charged to singly charged ions were measured: $X(++)/X(+) < 1 \times 10(+15)$, B(11); $< 2 \times 10(+15)$, C(12); $< 2 \times 10(+14)$, O(16). A relatively abundant formation of the short lived, metastable He(+) ion in the sputter source was observed. DOE

N84-10244# Argonne National Lab., Ill.
ELECTROCHEMICAL CHARACTERISTICS OF LITHIUM-SILICON ALLOY ELECTRODES FOR HIGH-TEMPERATURE-BATTERY APPLICATIONS
D. R. Vissers and L. Redey 1983 4 p refs Presented at the 34th ISE Meeting, Erlanger, West Germany, 18 Sep. 1983
(Contract W-31-109-eng-38)
(DE83-014343; CONF-830999-1) Avail: NTIS HC A02/MF A01

The electrochemical performance characteristics of lithium-silicon alloys as a negative electrode material for advanced molten salt battery cells were evaluated. The experimental design used to carry out the work was a small one dimensional electrode (ODE), operated in a cell. Reference electrodes were used in the cell to permit monitoring of the working electrode potential. The electrode performance was evaluated by galvanostatic cycling, dc pulse, and current-interruption, voltage-relaxation (CIPR) techniques. In the CIPR technique, the discharge current was interrupted and the potentials of the electrodes were allowed to relax from their values under load. DOE

N84-10245# Johns Hopkins Univ., Baltimore, Md.
FUEL IGNITION BY HIGH VOLTAGE CAPACITIVE DISCHARGES
Mary C. Chiu Mar. 1983 79 p refs
(PB83-209155; JHU/PPSE-T-18) Avail: NTIS HC A05/MF A01 CSCL 21B

The study examined the possibility for fuel ignition by spark discharge caused by induction effects under high voltage transmission lines. Theoretical background information on capacitive spark discharges and fuel ignition processes is given. Laboratory experiments were conducted to test the dependence of fuel ignition of three parameters: impedance in discharge path, multiple discharges, and larger electrode shapes. The results of these tests are discussed in terms of fuel ignition possibilities under high voltage transmission lines. Author (GRA)

N84-10246# Farleigh Dickinson Univ., Teaneck, N. J. Coll. of Science and Engineering.
CENTER FOR THE TRANSFER OF DESALINATION TECHNOLOGY Final Report, 30 Sep. 1978 - 31 Aug. 1981
Robert Bakish and Wallace Arthur Jun. 1983 47 p refs
(Contract DI-14-34-0001-0447)
(PB83-223057; W83-03352; OWRT-C-00101-D(0447)(1)) Avail: NTIS HC A03/MF A01 CSCL 07A

The Center was established at the Fairleigh Dickinson University, West Indies Laboratory, St. Croix, U.S. Virgin Islands. The main purpose was to demonstrate both the technical and economic merits of desalination to industry and the public at large. Primary emphasis was given to seawater desalting by reverse osmosis and brackish water conversion by electrodialysis. Research was conducted on pretreatment of raw seawater without employing acid and with a chlorine starvation technique. In addition, operators and engineers received hands-on training as the Center was used for both credit and non-credit educational courses. GRA

N84-10247# North Dakota Water Resources Research Inst., Fargo.
CHARACTERIZATION OF Kel-F-GRAPHITE COMPOSITE (KELGRAF) ELECTRODES AND APPLICATION TO DETECTION IN FLOWING STREAMS
Duane Eugene Weisshaar and D. E. Tallman Jan. 1983 261 p refs
(PB83-224204; W83-03369; OWRT-B-055-NDAK(1)) Avail: NTIS HC A12/MF A01 CSCL 07D

The active area of Kel-F graphite composite (Kelgraf) electrodes determined from short time chronoamperometric data agree well with the weight percent of graphite in the composite and with the percent conducting carbon on the surface determined from X ray photoelectron spectroscopy (XPS). The performance of Kelgraf as an electrode for electrochemical detection in flowing streams is discussed, including the determination of the optimum electrode composition and the linear dynamic range of the detector. The detector was applied to the determination of phenols in ground water and coal gasification waste water. Evidence based on chronoamperometry, XPS, SEM, cyclic voltammetry, and capacitance measurements point to the existence of a partial thin film of Kel-F over portions of the graphite sites. The implications of the presence of such a film are also discussed. GRA

N84-10248# North Dakota State Univ., Fargo. Dept. of Chemistry
APPLICATION OF KELGRAPH TO ELECTROCHEMICAL DETECTION TO FLOW INJECTION ANALYSIS AND HIGH PERFORMANCE LIQUID CHROMATOGRAPHY
Duane E. Weisshaar Jan. 1983 88 p refs
(Contract DI-14-34-0001-9036)
(PB83-226928; W83-03490; OWRT-A-063-NDKA(1)) Avail: NTIS HC A05/MF A01 CSCL 14B

The active area of Kel-F graphite composite (Kelgraf) electrodes determined from short time chronoamperometric data agree well with the weight percent of graphite in the composite and with the percent conducting carbon on the surface determined from X ray photoelectron spectroscopy (XPS). The performance of Kelgraf as an electrode for electrochemical detection in flowing streams is discussed, including the determination of the optimum electrode composition and the linear dynamic range of the detector. The detector was applied to the determination of phenols in groundwater and coal gasification waste water. Evidence based on chronoamperometry, XPS, SEM, cyclic voltammetry and capacitance measurements point to the existence of a partial thin film of Kel-F over portions of the graphite sites. GRA

N84-10249# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
SURFACE MODIFICATION OF SOME TITANATE MINERALS SUBJECTED TO HYDROTHERMAL CHEMICAL ATTACK
Sverre Myhra, David Savage, Alan Atkinson, and John C. Riviere May 1983 38 p refs
(AERE-R-10799) Avail: NTIS HC A03/MF A01

Several titanate minerals, CaTiO3, BaTiO3, BaAl2Ti6O16 and ZrCaTi2O7, have been subjected to hydrothermal chemical attack (350 C and 500 bars). The resultant modifications to the solid surfaces and release of atomic species into solution have been studied with surface analytical techniques (SEM, XPS and AES) as well as solution analysis. It has been observed that dissolved CO2 has a significant effect on the mechanisms which are operative at the solid/liquid interface. A model has been developed to account for the observed features such as precipitation of carbonates, formation of TiO2 on enriched surfaces and the approach to thermodynamic equilibrium for closed titanate-water systems. Author

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-10250# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
ELECTROTHERMAL PRODUCTION OF MAGNESIUM
M. J. Marchal 1982 15 p Transl. into ENGLISH from Produzione del Magnesio col Processo Elettrotermico (Italy), no. 3, 1966

p 82-86 Presented at the French-Italian Light Met. Symp., Milan, 9-12 May 1965
(CSIR-Trans-1679) Avail: NTIS HC A02/MF A01

The Magnetherm process for the thermal production of magnesium in a controlled partial vacuum in a single-stage electric furnace is based on the reduction of calcined dolomite with ferrosilicate in the presence of a residual slag which acts as a resistance. The furnace currently in use has a capacity of 3000 kg per day (1000 tonnes per year). The consumption of high-voltage electrical energy for the reduction is less than 11 kWh/kg of magnesium and the metal obtained has a purity of 99.8%. The residual slag from the process constitutes a useful raw material for the cement industry. A plant with a capacity of 3500 - 4000 tonnes per year commenced production in France in August 1964. Author

N84-10251# British Library Lending Div., Boston Spa (England).
PROPERTIES OF MANGANESE ALLOYS FOR CRYOGENIC ENGINEERING
B. S. Ermakov [1983] 3 p Transl. into ENGLISH from Izv. (USSR), no. 9, 1982 p 152
(BLL-M-35127-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Austenitic chrome-nickel steels, which exhibit a high level of low temperature strength and ductility properties are the most widely used steels in cryogenic engineering, but their magnetic permeability is fairy high and increases more rapidly with decrease in temperature the greater their nickel content. This situation is rectified by simultaneously alloying the steel with aluminum and chromium in place of nickel. Author

N84-10252# British Library Lending Div., Boston Spa (England).
PROPERTIES OF GREY CAST IRON TREATED WITH PULSATING CURRENT DURING INOCULATION
G. N. Minenko, B. L. Kogan, and N. N. Petrov 14 Jul. 1983 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 9, 1982 p 123-124
(BLL-M-35118-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Experiments were conducted on cupola iron to determine the influence of a pulsating electric current on the process of inoculation of grey cast iron with ferrosilicon, silicocalcium, ferrocerium, high-purity silicon, and electrode scrap. Change in the tensile properties of inoculated iron as a function of the power of the current passing through the melt was determined. The castability and chillability on initial inoculated iron and iron treated with a current were investigated to determine the influence of the current on the casting properties of the metal. The effect of electric current treatment on the quantity of eutectic grains in the structure of the inoculated cast iron was determined, as well as its effect on the density and kinematic viscosity of the melt. Author

N84-10253# British Library Lending Div., Boston Spa (England).
MAGNETIC PROPERTIES AND STRUCTURE OF MONOCRYSTALS OF Fe-24 PERCENT Cr-15 PERCENT Co-8 PERCENT W ALLOYS
I. S. Belyatskaya and E. V. Arabei 14 Jul. 1983 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 9, 1982 p 155
(BLL-M-35131-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

An examination was made of the influence of tungsten on features of the decomposition of Fe-Cr-Co alloys. The magnetic properties of monocrystals of Fe-24%Cr-15%Co-8%W alloy were measured after thermomagnetic treatment and after a complete heat treatment schedule. X-ray diffraction analysis was conducted on heat-treated specimens to determine their structure. Author

N84-10254# British Library Lending Div., Boston Spa (England).
NICKEL DIFFUSION ALONG SINGLE INTER-PHASE BOUNDARIES
B. S. Bokshtein, I. V. Videnskii, and L. M. Klinger 14 Jul. 1983 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1982 p 13-14
(BLL-M-35109-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The main parameters of nickel diffusion along boundaries in specially grown bi-crystals were determined and their values compared with those for bulk diffusion. Author

N84-10255# British Library Lending Div., Boston Spa (England).
PHASE TRANSFORMATIONS AND COERCIVE FORCE OF ALLOYS BASED ON THE COMPOUND SmCo5
B. G. Livshits, A. S. Lileev, and V. P. Menushenkov 14 Jul. 1983 8 p refs Transl. into ENGLISH from Izv. (USSR), p 95-99
(BLL-M-35117-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The results are presented of an investigation of the influence of two methods of heat treatment (with cooling from high and heating from low temperatures) on the coercive force and the structure of sintered alloys based on the compound in relation to their composition. The heat-treatment parameters ensuring attainment of maximal values of the coercive force for alloys of different compositions were established. High coercive force values were obtained not only on alloys containing an excess of samarium but also alloys richer in cobalt than the stoichiometric composition. The coercive force of cobalt-enriched alloys reaches maximal values at the initial stage of decomposition of the solid solution based on SmCo5 and is determined by the pinning of domain walls on microscopic precipitates of the Sm2Co17 phase.

N84-10256# British Library Lending Div., Boston Spa (England).
HEATING AND MELTING LOW-MELTING FERROALLOYS AND HARDENERS IN MOLTEN STEEL
N. V. Pamteleeva and Yu. P. Flimonov 6 Sep. 1983 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 156-157
(BLL-M-35219-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The mathematical model for the heating and melting of ferroalloys and hardeners (master alloys) immersed in molten steel accounts for the transfer of heat by convection from the molten steel to the solid ferroalloy and is used to determine more accurately the times it takes these additions to melt in the molten steel. Author

N84-10257# British Library Lending Div., Boston Spa (England).
THE REDISTRIBUTION OF SILICON DURING THE SPHEROIDIZING ANNEALING OF IRON
V. A. Baranova 15 Aug. 1983 4 p refs Transl. into ENGLISH from Izv. (USSR), p 155
(BLL-M-35167-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Research has led to the conclusion that cementite with an increased silicon content may be formed during the spheroidization of deformed pearlite in iron. Author

N84-10258# British Library Lending Div., Boston Spa (England).
THERMODYNAMIC ACTIVITY OF CARBON IN SOLID NICKEL
V. I. Alekseev and I. V. Degtyareva 6 Sep. 1983 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 11, 1982 p 5-9
(BLL-M-35192-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The H2-CH4 equilibrium with carbon in Ni-C alloys in the temperature range 1173 to 1373 K and with carbon concentrations of 0 to 1.1% (atom) was investigated with the use of a combination of the circulation and transport reactions methods. A strong positive deviation from the laws of ideal solutions was found to be characteristic of carbon behavior over the whole range of existence of the Ni-C solid solution. Equations were obtained for the temperature dependences of the partial molar free energy and of the solubility of graphite in nickel. The difference in the thermodynamic behavior of carbon in gamma-solutions based on iron and on nickel is attributed to the different degree of filling by electrons of the 3d-level of the metal atoms. Author

N84-10259# British Library Lending Div., Boston Spa (England).
THE MELTING OF IRON CONTAINING REDUCED AMOUNTS OF NON-FERROUS METAL IMPURITIES
V. I. Machikin, S. A. Ivanov, and E. N. Skladanovskii 6 Sep. 1983 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 148
(BLL-M-35209-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The amount of nonferrous metal impurities in iron is usually not controlled. Depending on the charge materials used and the heat technology, the amounts of impurities in iron produced vary as follows: chromium 0.002 to 0.090%, nickel 0.0001 to 0.070%, copper 0.010 to 0.054%, zinc 0.001 to 0.006%, lead 0.0001 to 0.0005%, tin 0.0001 to 0.0024%, antimony 0.0007 to 0.0062%. These wide ranges of amounts of nonferrous metals, together with variations in other inherited particulars, has a great effect on the qualities of castings of the iron. The affects of the heritage of iron for steelmaking on the properties of steel melted using it are unknown, but as the production of steels containing particularly small amounts of impurities is extended it can be expected that greater amounts of nonferrous metals will be needed in the iron.
S.L.

N84-10260# British Library Lending Div., Boston Spa (England).
DEVELOPMENT OF AN ALLOY WITH HIGH DAMPING PROPERTIES
V. N. Brinza, V. N. Ten, and S. M. Krivosh 6 Sep. 1983 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 150
(BLL-M-35211-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The results of developing an Fe-Cr-Al system damping alloy are given. Alloys in this system were produced by the normal method. The alloy containing 0.5% Al and 38.4% Cr, the remainder Fe, was found to have the highest damping properties. The logarithmic attenuation decrement maximum was 11.2%. The damping properties were determined, using cylindrical specimens, by means of a direct torsion pendulum in a magnetic field and without a magnetic field. A magnetic field of 320 A/m lowered the logarithmic decrement by 5 : 1. The optimum relationships between the effectiveness of methods of treatment and the particular chemical compositions of alloys coupled with their high damping powers were also determined. Author

N84-10261# British Library Lending Div., Boston Spa (England).
THE PART PLAYED BY THE SKIN IN THE DENITRATION OF METAL DURING VACUUM ARC REMELTING
G. I. Doronin, L. N. Belyanchikov, and M. D. Zharnitskii 6 Sep. 1983 14 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 151
(BLL-M-35213-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The nitrogen contents down to a depth of 8 to 20 mm in the peripheral regions of vacuum arc remelted (VAR) ingots are considerably higher than the nitrogen content of the remainder of the metal. This is because nitrogen is absorbed by the skins on ingots, and largely governs the depth to which ingots have to be stripped. In this case the skin acts as a getter vacuum pump with relation to nitrogen. In order to evaluate the proportion occupied by the getter removal of nitrogen in the overall process of its elimination during VAR, laboratory heats of KhN73MBTYu alloy were carried out in a mould with a diameter D (sub m) = 53 mm with a current of 900 A. Mathematical analysis provides the following picture for the distribution of nitrogen in an ingot on the condition that the total amount of nitrogen in the initial metal is taken as 100% : the nitrogen content in the 10 mm thick surface layer is 45%; the nitrogen content of an ingot without taking the surface layer into account is 21%; the desorption of nitrogen into the gas phase from the molten metal is 34%. Author

N84-10262# British Library Lending Div., Boston Spa (England).
FEATURES OF DETERMINATION OF LOW CONCENTRATIONS OF OXYGEN IN STEEL BY THE ELECTROCHEMICAL METHOD
S. S. Guskov, V. V. Linchevskii, and V. A. Dubok 6 Sep. 1983 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 150-151
(BLL-M-35212-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Stabilized ZrO2 only has a purely ionic nature of conductivity within a specific range of concentrations of oxygen. When concentrations of oxygen below the critical figure are measured, a considerable error is caused by the appearance of a substantial electronic component of conductivity. When measurements of low oxygen partial pressures in metal being investigated are measured, the electronic component of conductivity, which depends both on the composition of the solid electrolyte and on temperature must be taken into account. Author

N84-10263# British Library Lending Div., Boston Spa (England).
ELECTRICAL RESISTANCES OF MOLTEN ALLOYS OF IRON CONTAINING CARBON, BORON AND PHOSPHORUS
S. N. Zhuravlev, O. I. Ostrovskii, and V. A. Grigoryan 6 Sep. 1983 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 11, 1982 p 152
(BLL-M-35214-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The eddy current method, which is free from the failings in the rotating magnetic field method, was used for finding details of the electrical resistance of certain alloys. Reasons are given for the behavior of curves for the relationships of rho and drho/dT to concentration. Author

N84-10264# British Library Lending Div., Boston Spa (England).
AMORPHOUS MATERIALS FROM PRECISION ALLOYS
B. V. Molotilov, V. P. Ovcharov, A. F. Prokoshin, and A. G. Kozlov 6 Sep. 1983 9 p refs Transl. into ENGLISH from Stal. (USSR), v. 11, 1982 p 53-54
(BLL-M-35179-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

An examination is made of the most widely used method for production of amorphous alloys: quenching a jet of liquid metal on rotary metal coolers. The influence of process factors on the structure of the alloys and the quality of the sections produced from them is examined. The main physical properties of amorphous precision alloys are analyzed. The possible fields of application of amorphous alloys are discussed. Author

N84-10265# British Library Lending Div., Boston Spa (England).
STRESS CORROSION RESISTANCE OF Z 6 CN 18-9 STEEL: INFLUENCE OF SURFACE TREATMENT (SHOT PEENING, POLISHING)
A. Niku-Lari, G. Beranger, and P. Meniel 14 Jul. 1983 19 p refs Transl. into ENGLISH from Mater. et Tech. (France), Jan. - Feb. 1983 p 37-44
(BLL-Risley-Tr-4777-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The importance of stress corrosion phenomena no longer has to be demonstrated. It is known that many mechanical assemblies undergo this phenomenon when they are under the combined action of an agressive medium and of mechanical tensile stresses. Stress corrosion cracking is influenced in particular by the nature of the material/medium pair, generally specified by the following parameters: chemical composition and structure of the material; surface finish of the component; state of residual surface stress (expressed here by shot peening intensity); level of service stresses; chemical composition and characteristics of the corrosive medium. The influence of the surface finish of Z 6 CN 18-9 austenitic stainless steel on its resistance to stress corrosion cracking was examined. In particular, the influence of different polishing treatments and of shot peening on the phenomenon were studied. Author

N84-10266*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
A CRITICAL STUDY OF THE ROLE OF THE SURFACE OXIDE

LAYER IN TITANIUM BONDING Final Technical Report
S. Dias and J. P. Wightman Aug. 1983 65 p refs
(Contract NAG1-252)
(NASA-CR-174531) Avail: NTIS HC A04/MF A01 CSCL 11F

Scanning electron microscope/X-ray photoelectron spectroscopy (SEM/XPS) analysis of fractured adhesively bonded Ti 6-4 samples is discussed. The text adhesives incuded NR 056X polyimide, polypheylquinoxaline (PPQ), and LARC-13 polyimide. Differentiation between cohesive and interfacial failure was based on the absence of presence of a Ti 2p XPS photopeak. In addition, the surface oxide layer on Ti-(6A1-4V) adherends is characterized and bond strength and durability are addressed. Bond durability in various environmenal conditions is discussed. M.G.

N84-10267*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
FATIGUE CRACK GROWTH AND LOW CYCLE FATIGUE OF TWO NICKEL BASE SUPERALLOYS Final Report
N. S. Stoloff, D. J. Duquette, S. J. Choe, and S. Golwalkar 16 Sep. 1983 51 p refs
(Contract NAG3-22)
(NASA-CR-174534; NAS 1.26:174534) Avail: NTIS HC A04/MF A01 CSCL 11F

The fatigue crack growth and low cycle fatigue behavior of two P/M superalloys, Rene 95 and Astrology, in the hot isostatically pressed (HIP) condition, was determined. Test variables included frequency, temperature, environment, and hold times at peak tensile loads (or strains). Crack initiation sites were identified in both alloys. Crack growth rates were shown to increase in argon with decreasing frequency or with the imposition of hold times. This behavior was attributed to the effect of oxygen in the argon. Auger analyses were performed on oxide films formed in argon. Low cycle fatigue lives also were degraded by tensile hold, contrary to previous reports in the literature. The role of environment in low cycle fatigue behavior is discussed. M.G.

N84-10268*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
LOW STRAIN, LONG LIFE CREEP FATIGUE OF AF2-1DA AND INCO 718
A. B. Thakker and B. A. Cowles Apr. 1983 152 p refs
(Contract NAS3-22387)
(NASA-CR-167989; NAS 1.26:167989; FR-15652) Avail: NTIS HC A08/MF A01 CSCL 11F

Two aircraft turbine disk alloys, GATORIZED AF2-DA and INCO 718 were evaluated for their low strain long life creep-fatigue behavior. Static (tensile and creep rupture) and cyclic properties of both alloys were characterized. The cntrolled strain LCF tests were conducted at 760 C (1400 F) and 649 C (1200 F) for AF2-1DA and INCO 718, respectively. Hold times were varied for tensile, compressive and tensile/compressive strain dwell (relaxation) tests. Stress (creep) hold behavior of AF2-1DA was also evaluated. Generally, INCO 718 exhibited more pronounced reduction in cyclic life due to hold than AF2-1DA. The percent reduction in life for both alloys for strain dwell tests was greater at low strain ranges (longer life regime). Changing hold time from 0 to 0.5, 2.0 and 15.0 min. resulted in corresponding reductions in life. The continuous cycle and cyclic/dwell initiation failure mechanism was predominantly transgranular for AF2-1DA and intergranular for INCO 718. Author

N84-10269# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF STRUCTURAL FACTORS ON THE CRACK RESISTANCE OF TUNGSTEN CARBIDE/COBALT ALLOYS AT HIGH TEMPERATURES
N. V. Novikov 1982 11 p refs Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 5, 1981 p 20-26
(CSIR-1682) Avail: NTIS HC A02/MF A01

Hard alloy cutting tools are subjected to high temperatures and stresses during use. Up to 40 to 50% of the total number of tools may be out of commission at any one time on account of breakage after only 25 to 30% of their rated life. The crack resistance of hard alloys at high temperatures and determination of material structural parameters are investigated. Tests were carried out to determine the linear elastic mechanisms of deterioration of hard alloys and the effect of high temperatures on the crack resistance of hard tungsten alloys with different carbide alloy grain sizes (d sub WC). Samples made from hard alloys containing 5, 10 and 20% of cobalt phase grains of approximately 2,0 approximately 3,9 and approximately 9,3 microns were prepared. The mixture was prepared from coarse-grained 'high temperature' tungsten carbide 6,10%, C sub CB = 0,05%, methanol vapour adsorption 0,09 mg/g) and tungsten cobalt (weight 0.01 g/cu cm 3, O2 content 0,4%). S.L.

N84-10270# British Library Lending Div., Boston Spa (England).
THE OXIDATION OF POROUS METALS
S. M. Krivosh (Moscow Steel and Alloys Inst.) and R. G. Ryndina (Moscow Steel and Alloys Inst.) 14 Jul. 1983 3 p refs
(BLL-Trans-Iz.148-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The process of the oxidation of metals in the form of pellets or other regular shaped lumps was investigated on the basis of solving the equation for diffusion with currents of oxidant. It was established that at temperatures of $>$ 670 to 970 k, oxidation may not take place throughout the entire volume of a lump, while the depth to which the oxidant penetrates decreases as the temperature is raised. On this basis, also allowing for the fact that the Pilling-Bedfords coefficient beta $>$ 1 for oxides of iron, it was possible to give an overall explanation of the drop in the degree to which limps of sponge iron are oxidized as the temperature is raised. Author

N84-10271# British Library Lending Div., Boston Spa (England).
THE EFFECT OF TECHNOLOGICAL PARAMETERS ON THE HETEROGENEITY OF CONTINUOUSLY CAST SLAB
D. A. Dyudkin, N. A. Zorenko, V. M. Onopchenko, V. S. Baikov, and O. V. Nosochenko 1982 8 p Transl. into ENGLISH from Russian Document (USSR), St., v. 9, 1982 p 45-48
(BLL-M-35095-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The heterogeneity of continuously cast slabs is revealed in the nonuniform distribution of the elements transversely which has practically no connection with the presence of structural zones. Negative segregation is at a maximum in the surface layer and positive segregation, in the central zone. This is due to the intensity of convection currents, bulging of the slab and the variation in the solidification rate. Segregation increases with an increase in casting speed, in slab thickness and with a reduction in the zone of equiaxed dendrites. Slab thickness is reduced to 150 to 170 mm to increase strand uniformity and segregation is reduced by nonpressurized metal feed and the use of an intermediate mold. Author

N84-10272# British Library Lending Div., Boston Spa (England).
CALCULATION OF CRITICAL TEMPERATURES AND CORRELATION PARAMETERS IN BINARY ALLOYS BY THE METHOD OF BBGKI EQUATIONS
Yu. S. Stark (Moscow Steel and Alloys Inst.) and A. S. Shteinberg (Moscow Steel and Alloys Inst.) 6 Sep. 1983 12 p refs Transl. into ENGLISH from Izv. VUZ Chenaya Met. (USSR), (11) 1982 (BLL-M-35200-(5828.4); Iz-83-88) Avail: British Library Lending Div., Boston Spa, Engl.

A chain of Bogolyubov. Born-Green-Kirkwood-Ivone (BBGKI) equations was obtained for lattice systems. The temperatures of the order-disorder phase transition in structures with simple lattices and the correlation parameters in alloy AB with a b.c.c. lattice were calculated. Author

N84-10273# Electricity Council, London (England). Overseas Translations Service.
EXAMINATION OF THE ELECTROCHEMICAL BEHAVIOUR OF TITANIUM IN THE LIC1-KC1 MELT
I. A. Filippova and A. N. Baraboshkin Aug. 1983 17 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Uralsk Nauch.

Tsentr., Ionnye Rasplavy i Tverdye Elek. (USSR), 1978 p 35-42 (BLL-OA-Trans-3010-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

Investigations were conducted into the kinetics of precipitation of Ti on steel during the electrolysis of KC1-LiC1 melts with 1 to 8.6 wt-% of Ti at 400 to 500 C. It was shown that the dissolution of Ti at these temperatures is accompanied by a marked concentration polarization caused by the low solubility of chlorides of bivalent titanium and by the low rate of their diffusion. The diffusion coefficient of the ions of bivalent titanium and the thickness of the diffusion layer in the melt of potassium and lithium chlorides in the given temperature range were determined. Author

N84-10274# Electricity Council, London (England).
ON THE ELECTROCHEMICAL PRECIPATION OF TITANIUM COATINGS
V. S. Balikhin and S. B. Makarov 12 Aug. 1983 7 p refs Transl. into ENGLISH of Proc. of 2nd All-Union Seminar on the Electrochem. of Refractory Rare Metals (USSR) Presented at the 2nd All-Union Seminar on the Electrochem. of Refractory Rare Metals, USSR, 10-12 Oct. 1978
(BLL-OA-Trans-3028-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

The followng characteristics were determined: the thickness of the coating, its soundness, bonding to the substrate, and the texture of the coating. In the precipitation of Ti from the melts based on NaCl-KCl and LiCl-KCl, the thickness of smoothh, poreless coatings in all the electrolysis conditions did not exceed 10 microns. An increase in the duration of electrolysis resulted in the precipitation of powder metal and not in an increase in the thickness of the dense coating. The coating was not textured, i.e. the orientation of the grains was random. The densest and most uniform Ti layers with strong bonding to the copper substrate were obtained at a temperature of 700 C and a current density of 0.1-0.2 A/sq. cm. N.W.

N84-10275# Electricity Council, London (England). Overseas Relations Branch.
THE CATHODIC POLARIZATION OF NICKEL DURING PRECIPITATION FROM PURE SOLUTIONS WITHOUT ADDITIONS
V. M. Nagirnyi, V. M. Chaikovskaya, and S. M. Loboda 15 Aug. 1983 10 p refs Transl. into ENGLISH from Voposy Khim. i Khim. Tekhn. (USSR), no. 5, 1978 p 14-18
(BLL-OA-Trans-3004-(6196.3); Rept-1) Avail: British Library Lending Div., Boston Spa, Engl.

The experiments were carried out in a leak-tight H-shaped glass electrolyzes with 500 ml sections; the cathode and anode spaces were separated by a porous diaphragm. All the experiments were conducted in hydrogen which was passed at a constant flow rate through the electrolyte. The accuracy of thermostatic control was +/- 0.5 C. The cathodes were made of sheets of platinum, palladium, and pure rolled nickel which were placed in glass cassettes with a working surface of 0.9 sq cm. Measurements were also taken on a smooth freshly precipitated surface of nickel. These nickel deposits were produced in the given electrolyte. The anode was represented by a platinum sheet. N.W.

N84-10276# Electricity Council, London (England). Overseas Relations Branch.
THE CATHODIC POLARIZATION OF NICKEL DURING PRECIPITATION FROM PURE SOLUTIONS WITHOUT ADDITIONS
V. M. Nagirnyi, V. M. Chaikovskaya, and S. M. Loboda 15 Aug. 1983 9 p refs Transl. into ENGLISH from Viprosy Khim. i Khim. Tekhn. (USSR), no. 51, 1978 p 18-22
(BLL-OA-Trans-3003-(6196.3); Rept-2) Avail: British Library Lending Div., Boston Spa, Engl.

The kinetics of cathode precipitation of nickel were investigated using the method of partial curves. Deposits were obtained only on cathodes made of pure rolled nickel. Deposits were obtained only on cathodes made of pure rolled nickel. To ensure the constant electrolysis conditions, the experiments were conducted within short periods of time (10-120 min), and the amount of electric power was identical for all the experimental points. The variation of potential with time in the individual experiments did not exceed 3 mV. The reproducibility of the experimental points varied within approximately the same range. The current efficiency was determined by the weight method using a copper coulometer. N.W.

N84-10277# IIT Research Inst., Chicago, Ill.
LASER SURFACE HARDENED PATTERNS FOR INCREASED BALLISTIC PROTECTION Final Report, Aug. 1982 - Feb. 1983
J. J. Kramer and J. L. Dorcic Warren, Mich. Army Tank-Automotive Command Apr. 1983 27 p
(Contract DAAE07-82-M-9053)
(AD-A130385; TACOM-TR-12772; IITRI-K06038-1) Avail: NTIS HC A03/MF A01 CSCL 19/4

Laser transformation hardening of selected patterns on RHA armor plate, represents a potential method of increasing ballistic capabilities of this material. This program applied 16 rows of 1/2 x 1 in. surface hardened patterns to 18 armor plates in two heat-treated conditions and two patterns. Tests indicated that the hardened patterns achieved a hardness level of 55-59 HRC. The plates were returned to TACOM for ballistic evaluation. GRA

N84-10278# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex. Structures and Materials Research Dept.
BETA TITANIUM ALLOY METAL-METAL LAMINATES: FABRICATION, STRUCTURE AND MECHANICAL PROPERTIES Final Report, Sep. 1981 - Feb. 1983
L. E. Sloter Apr. 1983 68 p refs
(Contract N00019-81-C-0444)
(AD-A130378; ATC-R-92000/3CR-35) Avail: NTIS HC A04/MF A01 CSCL 11/6

The fabrication procedure, structure, and mechanical properties of metal-metal laminates composed of three layers of the near beta titanium alloy, Ti-10V-2Fe-3Al, interleaved by thin laminae of Transage 134 (Ti-2Al-12V-2Sn-6Zr), a martensitic beta titanium alloy, are presented and discussed. The laminates were formed by hot roll bonding of layered lay-ups welded at the seams for stability. Following bonding, the tensile and fracture toughness properties of the laminate material heat treated to varying strength levels were measured and contrasted with monolithic Ti-10-2-3 heat treated in the same way. A solution treated and aged heat treatment that tripled critical fracture toughness in the laminate material with only a moderate loss in strength was developed. The tensile, fracture toughness, and microstructural properties associated with each heat treatment are reviewed and analyzed. In addition, the mechanisms of fracture toughness improvement in this laminate system are described and rationalized with the properties of the two alloys. In general, the two alloys are shown to be a excellent titanium metal-metal laminate system for fracture critical structural application. GRA

N84-10279# Georgia Inst. of Tech., Atlanta. Lab. for Electronics and Computer Systems.
METAL-INSULATOR-METAL JUNCTIONS AS SURFACE SOURCES OF INTERMODULATION Final Technical Report, Sep. 1980 - Nov. 1982
T. G. Shands and J. A. Woody Griffiss AFB, N.Y. RADC Feb. 1983 90 p refs
(Contract F30602-81-C-0268; AF Proj. 2338)
(AD-A130451; RADC-TR-83-31) Avail: NTIS HC A05/MF A01 CSCL 11/6

This program was performed to investigate metal-insulator-metal (MIM) junctions as surface sources of intermodulation (IM) on Command, Control, Communications, and Intelligence (C3I) aircraft. The IM levels generated by MIM junctions were evaluated for various material and physical parameters of the junctions as well as electromagnetic properties of the applied signals. A total of 57 test samples were fabricated to be representative of MIM junctions which are found on aircraft. The IM levels of these junctions were measured using a previously developed measurement scheme. Models were developed which describe the IM behavior as a function of some of the parameters. These parameters include input power, temperature, pressure, material and construction of the MIM junction. The changes due to other

parameters were smaller than the variability of the data for a single test sample. In order to verify the model, two additional test samples were constructed, measured, and compared to predicted values. Author (GRA)

N84-10280# McDonnell-Douglas Research Labs., St. Louis, Mo.
OPTIMUM MICROSTRUCTURES FOR SPF (SUPERPLASTIC FORMING) USING HYDROVAC Final Report, 1 Sep. 1980 - 1 Oct. 1982
S. M. L. Sastry, R. J. Lederick, and J. E. ONeal Wright-Patterson AFB, Ohio AFWAL Feb. 1983 128 p refs
(Contract F33615-80-C-5118; AF Proj. 2418)
(AD-A130944; AFWAL-TR-83-4018) Avail: NTIS HC A07/MF A01 CSCL 11/6

The effects of the addition of up to 1.0 wt% hydrogen as a transient alloying element on the mechanical properties, superplastic forming (SPF), and diffusion bonding (DB) of fine-grained equiaxed Ti-6Al-4V and duplex-annealed Ti-6Al-2Sn-4Zr-2Mo were determined. The results of a systematic study of the beneficial effects of hydrogen on superplasticity and tensile and creep properties of Ti alloys are presented in this report. The microstructural refinement and property improvement affected by the heat treatment of Ti alloys containing hydrogen and the effects of internal hydrogen on the superplastic forming and diffusion bonding of ti alloys were determined. GRA

N84-10281# Rice Univ., Houston, Tex. Dept. of Mechanical Engineering.
METALLURGICAL CHARACTERIZATION OF NIOBIUM/TIN SUPERCONDUCTING MULTIFILAMENTARY WIRES Final Report, 1 Apr. - 31 Dec. 1982
John Melville Roberts 31 Mar. 1983 39 p refs
(Grant AF-AFOSR-0150-82; AF Proj. 2306)
(AD-A131018; AFOSR-83-0596TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The origin of a high incidence of discontinuous Nb filaments in Niobium/bronze multifilamentary drawn wires is discussed. It is suggested their occurrence is most likely an intrinsic part of the manufacturing process. Studies on the application of the limiting grain size concept in the bronze by the Nb filaments, suggests this effect only sets an upper bound on the attainable grain size and in reality, the actually observed grain size and sub-grain size is lower than this upper bound. This leads to extensive hardening of the bronze phase as the Nb/bronze multifilamentary wires are progressively reduced to ultra-fine dimensions. Preliminary ageing studies of a 13 wt % Sn bronze alloy, suggest the alpha bronze may exhibit some age hardening decomposition phenomena in the 300 to 400 degree C temperature range for unprestrained solution heat treated and quenched material. An even stronger hardening phenomena in this temperature range occurs if the material is prestrained 65% in compression after solution heat treatment but prior to ageing. Contemplated further studies in the area are presented. Author (GRA)

N84-10282# Georgia Inst. of Tech., Atlanta. Fracture and Fatigue Research Lab.
THE EFFECTS OF POWDER METALLURGICAL PROCESSING AND INTERMEDIATE THERMAL MECHANICAL TREATMENT ON THE FATIGUE PROPERTIES OF HIGH STRENGTH ALUMINUM ALLOYS Final Report, 1 Apr. 1980 - 31 Mar. 1983
Victor Kuo, H. Chang, and E. A. Starke, Jr. 1983 27 p refs
(Contract DAAG29-80-C-0100)
(AD-A130790; ARO-17161.6-MS) Avail: NTIS HC A03/MF A01 CSCL 11/6

The application of advanced metallurgical processing techniques, e.g., intermediate thermomechanical treatment (ITMT) and powder metallurgy (P/M), has produced a recrystallized X7091 P/M alloy having fine grain and particle structures and weak texture with the best overall mechanical properties compared to those of ingot metallurgical and conventional P/M alloys. The dependence of mechanical properties on grain size and particle distribution has been demonstrated among these alloys. The study of the effect of the last microstructural feature, crystallographic texture, is necessary for further property improvement through texture control. GRA

N84-10283# National Bureau of Standards, Washington, D.C. Center for Materials Science.
THE MECHANISM OF ANAEROBIC (MICROBIAL) CORROSION Technical Summary Report, 1 Jun. - 31 Dec. 1982
Warren P. Iverson and Gregory J. Olson Dec. 1982 40 p refs
(Contract N00014-82-F-0086; Grant AF-AFOSR-0709-82; AF Proj. 2303; NR Proj. 205-046)
(AD-A131223; AFOSR-83-0709TR; TSR-1) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report in the form of three papers describes research into the role of bacteria in anaerobic corrosion processes. During the year we have given more evidence for a novel mechanism of anaerobic corrosion in which a volatile, highly reactive phosphorus compound is produced as a result of the activities of sulfate-reducing bacteria (Desulfovibio desuluricans). The corrosion product is an amorphous type of iron phosphide which can be detected by the formation of phosphine upon its acidification. Phosphine (in addition to H2S) has been detected from all the cases of suspected anaerobic corrosion (including tubercles from the inside of water pipes) examined so far. In examining the headspace over growing cultures of Desulfovibio to detect this volatile phosphorus containing compound, using a gas chromatograph (GC) with a flame photometric detector (FPD) specific for phosphorus and sulfur, two sulfur compounds, in addition to H2S, were detected and identified. These compounds, methylmercaptan, and dimethyldisulfide, were found to be relatively non-corrosive to iron under anaerobic conditions. No volatile phosphorus compounds were detected. GRA

N84-10284# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
SIMPLE STRUCTURAL UNIT MODEL FOR CORE-DEPENDENT PROPERTIES OF SYMMETRICAL TILT BOUNDARIES
R. W. Balluffi and A. Brokman (Hebrew Univ.) Apr. 1983 5 p refs Sponsored in part by the US-Israel Binational Science Foundation
(Contract DE-AC02-78ER-05002)
(DE83-012620; DOE/ER-05002/35) Avail: NTIS HC A02/MF A01

Consider any physical property, p, of a grain boundary, which depends primarily on the atomic structure of the core, e.g., the boundary diffusivity or the core energy. This note demonstrates that the recently determined structural unit model for the core structure allows one to estimate p for any boundary in a series of symmetrical tilt boundaries possessing a range of tilt angles if values of p for a few particular boundaries in the series are known. P for all boundaries with misorientations between those of two so-called favored boundaries can be estimated from a knowledge of the values of p for the two favored boundaries and the intermediate boundary made up of equal numbers of the structural units comprising the two favored boundaries. Applications of the results to measurements of boundary diffusivities and boundary energies are indicated briefly. DOE

N84-10285# Westinghouse Electric Corp., Pittsburgh, Pa.
HYDROGEN-EVOLUTION MONITORING AS A MEASURE OF STEAM-GENERATOR CORROSION Final Report
C. R. Wilson Nov. 1982 58 p refs Sponsored by EPRI
(EPRI Proj. S117-1)
(DE83-900677; EPRI-NP-2650) Avail: NTIS HC A04/MF A01

A system that can provide plant operating personnel with a reliable, quantitative, on-line indication of steam generator corrosion for steaming above about 30% of capacity was developed and tested. With the cooperation of eight utilities that allowed measurements to be made at their facilities, the hydrogen analyzer reliably measured hydrogen in feedwater and steam. After calibration, the monitor required little attention during continuous operation. Accuracy was + or - 5% for hydrogen greater than 2 ppb by weight. ion of about 0.020 lbs/h of steel or an average of 6 mils/yr in crevices of a steam generator. It was found that the decomposi-

tion reactions of hydrazine vary from plant to plant, apparently depending on secondary system bulk and surface reactions. Also, primary-to-secondary permeation of hydrogen is proportional to the partial pressure of primary hydrogen and possibly inversely proportional to the oxide film thickness on the tube. GRA

N84-10286# Westinghouse Electric Corp., Pittsburgh, Pa. Nuclear Technology Div.

EFFECT OF CALCIUM HYDROXIDE AND CARBONATES ON IGA AND SCC OF ALLOY 600 Final Report

J. R. Balavage May 1983 118 p refs Sponsored by EPRI

(EPRI Proj. S193-3)

(DE83-902229; EPRI-NP-3060) Avail: NTIS HC A06/MF A01

A series of five tests was conducted at the Westinghouse Forest Hills Single Tube Model Boiler (STME) Facility. The objective of the project was to determine if alkaline earth carbonates and/or hydroxides are key ingredients in causing intergranular attack (IGA) or stress corrosion cracking (SCC) of mill-annealed Alloy 600. Also as part of this program a report was written and issued detailing the earlier related STMB work Westinghouse conducted that led to reproducible SCC. The work reported here was an extension of that work. DOE

N84-10287# Combustion Engineering, Inc., Windsor, Conn. Nuclear Power Systems.

DESIGN AND CONSTRUCTION OF DEEP TUBESHEET CREVICE DEVICES FOR PRODUCING INTERGRANULAR ATTACK OF HEAT TRANSFER TUBING Final Report

J. J. Krupowicz, B. W. Kinyon, and L. M. Russell May 1983 82 p Sponsored by EPRI

(EPRI Proj. S193-2)

(DE83-902228; EPRI-NP-3058) Avail: NTIS HC A05/MF A01

The design and construction of two Tubesheet Crevice Simulation Apparatus (TCSA's) which were built to reproduce intergranular attack of steam generator heat transfer tubing are described. The units include several design features rendering them representative of the tubesheet regions of currently operating steam generators. Thermal and hydraulic data and analyses are presented and discussed. The TCSA's incorporated full-depth (22-inch) SA-508 Class 2 tubesheet material. Seven heat transfer tubes were installed in each unit by minimum rolling. Tubing included various metallurgical conditions of Alloys 600 and 800. Stressed C-ring corrosion specimens were also added to the secondary bulk water regions of both tests. These test materials are documented and also test operations are discussed. DOE

N84-10288# California Univ., Livermore. Lawrence Livermore Lab.

THERMAL STABILITY OF FOUR HIGH-STRENGTH, HIGH-CONDUCTIVITY COPPER SHEET ALLOYS

E. N. C. Dalder, W. Lundeman, and B. Schumacher 26 Apr. 1983 57 p refs Presented at DOE Workshop on Copper Alloys, Washington, D.C., 14 Apr. 1983 Revised Submitted for publication

(Contract W-7405-eng-48)

(DE83-013312; UCRL-89034-Rev-1; CONF-830466-Rev-1) Avail: NTIS HC A02/MF A01

The effects of the thermal treatments used during diffusion bonding, forming, and tritiding 50-cm-dia. RTNS-II targets on the room temperature tensile properties of Amzirc, MZC, Elbrodur RS, and Glid-Cop copper alloy sheets of 0.04-in. thickness were studied. The MZC sheet supplied to LLNL appears to have been improperly manufactured. The Amzirc sheet supplied to LLNL appears to have thermal-stability properties comparable to those exhibited by the Amax-processed product. The most likely explanation for the observed loss of strength is recrystallization. Elbrodur RS softens at 1200 C higher than either Amzirc or MZC. Glid-Cop sheet exhibited excellent thermal stability, most likely due to the effectiveness of the inert Al2O3 dispersion in inhibiting recrystallization. DOE

N84-10289# Rockwell International Corp., Golden, Colo.

CHANGES IN ACOUSTIC EMISSION PEAKS IN PRECIPITATION STRENGHTENED ALLOYS WITH HEAT TRETMENT

C. R. Heiple and S. H. Carpenter 1983 13 p refs

(Contract DE-AC04-76DP-03533)

(DE83-013611; RFP-03388) Avail: NTIS HC A02/MF A01

Acoustic emission was measured during tensile deformation as a function of prior heat treatment in 7075, 6061, and 2219 aluminum; a modified A-286 stainless steel (JBK-75); an experimental beryllium-containing stainless steel; and Incoloy 903. A rms voltage peak was observed in all the alloys near the onset of plastic flow. A second peak was usually observed in 7075, 2219, and Incoloy 903 at plastic strains greater than 1%. Some evidence of a second peak was also observed in 6061 aluminum. Changes with heat treatment in the stress and strain at which the second peak occurred were consistent with the peak arising from the fracture of inclusions. The stress on the inclusions at the second peak were relatively insensitive to prior heat treatment. The amplitude distributions of acoustic emission signals were also consistent with this interpretation. The strain at which the first acoustic emission peak occurred also varied with heat treatment, but the dependence of peak location on prior aging was different for the various alloys. DOE

N84-10290# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

HIGH-TEMPERATURE CORROSION OF IRON AND IRON-BASED ALLOYS IN SULFUR-CONTAINING ATMOSPHERES Ph.D. Thesis

Frank Chin-tai Yang Apr. 1983 147 p refs

(Contract DE-AC03-76SF-00098)

(DE83-013843; LBL-16089) Avail: NTIS HC A07/MF A01

The corrosion morphology, kinetics, and mechanism of the attack on metals and some iron-based alloys by sulfur-containing atmospheres were studied at 8710 C. In case of pure iron, protrusions with sulfide-rich cores were observed on the scale surface. This morphology is explained by the fast transport of iron ions through the sulfide-rich streaks. Models of unbalanced diffusion are proposed to account for the formation of an inner porous layer. The addition of alloying elements, such as Al and Cr, improves the corrosion resistance by forming a protective Al2O3 or Cr2O3 oxide scale. The transport of sulfur through scales, the thermodynamic conditions for the formation of duplex oxide-sulfide scales, and the influence of alloying elements are discussed. It is concluded that sulfur penetration through both performed and growing Al2O3 and Cr2O3 scales resulting in an accelerated attack is inevitable. Ways of slowing down the attack are recommended. DOE

N84-10291# Brookhaven National Lab., Upton, N. Y. Corrosion Science Group.

CATHODIC PROTECTION IN SIMULATED GEOTHERMAL ENVIRONMENTS

R. Bandy and D. vanRooyen 1983 26 p refs Presented at the Natl. Assoc. of Corrosion Engr. Meeting, San Francisco, 17 Jan. 1983

(Contract DE-AC02-76CH-00016)

(DE83-013690; BNL-33081; CONF-830144-1) Avail: NTIS HC A03/MF A01

The results of cathodic protection of carbon steel and AISI Type 316 stainless steel in simulated geothermal brines are described. Impressed current tests on carbon steel and stainless steel were conducted under controlled potential, and cathodic protection of carbon steel using zinc sacrificial anodes was studied by monitoring the galvanic current and potential of the couple with a zero resistance ammeter. Weight-loss measurements and photomicrographs of test coupons were taken whenever necessary to determine the nature of attack and degree of protection. Tests were generally conducted at 900 C. However, some tests on carbon steel were conducted up to 1500 C in a titanium autoclave. Results show that the weight loss of carbon steel can be reduced significantly and the pitting corrosion of the stainless steel can be prevented by shifting the potentials of the metals 60 to 80 mV cathodic to their respective open circuit potentials. DOE

N84-10292# Battelle Columbus Labs., Ohio.
METALLURGICAL INVESTIGATION OF A CRACKED LOW-PRESSURE STEM-TURBINE SHAFT FROM AN ELECTRIC UTILITY Final Report
R. D. Buchheit Mar. 1983 47 p refs Sponsored by Electric Power Research Inst.
(DE83-902304; EPRI-CS-2984) Avail: NTIS HC A03/MF A01

Metallurgical failure analysis was completed on a low pressure steam turbine shaft that cracked at two locations duing approximately 15 years of service. The investigation involved examinations of the surface of the shaft containing the cracks, fractographic studies, metallographic examination, tensile tests and chemical analysis. The tensile properties and composition were found to meet the requirements of class 5 alloy steel of ASTM A470-78 specification. The microstructure was typical of such steel in the normalized condition. The failure mechanism was identified to be high cycle fatigue. DOE

N84-10293# Sandia Labs., Livermore, Calif.
THE X-RAY-DIFFRACTION ANALYSIS OF CORROSION PRODUCTS OF Fe-Ni-Cr ALLOYS FORMED IN MOLTEN-NITRATE SALTS
D. R. Boehme and R. W. Bradshaw May 1983 21 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013317; SAND-83-8223) Avail: NTIS HC A02/MF A01

Chemical phase identifications of complex, multilayered corrosion products formed on Fe-Ni-Cr alloys immersed in molten NaNO3-KNO3 and LiNO3-NaNO3-KNO3 were obtained by X-ray diffraction analysis. Diffraction analyses performed after successive material removal steps provided dept profiles of corrosion products and identified the dominant phases as NaFeO2, Fe3O4 and Cr2O3 for Alloy 800 and 316SS after immersion in NaNO3-KNO3. In LiNO3-NaNO3-KNO3, the major corrosion products identified on Alloy 800 were LiFeO2, Fe3O4 and Cr2O3. X-ray diffraction results were supplemented by electron microprobe analyses which revealed the solid solution nature of several of the oxide phases. DOE

N84-10294# Sandia Labs., Albuquerque, N. Mex.
FRACTURE-TOUGHNESS TESTING OF DUCTILE CAST IRONS
R. Salzbrenner, J. A. VanDenAvyle, and T. J. Lutz (Texas A and M Univ., College Station) 1983 37 p refs Presented at the 16th Natl. Symp. on Fracture Mech., Columbus, Ohio, 15 Aug. 1983
(Contract DE-Ac04-76DP-00789)
(DE83-010824; SAND-83-00290; CONF-830820-1) Avail: NTIS HC A03/MF A01

The fracture toughness of ferritic, spheroidal graphite ductile cast iron was measured by a single specimen J-integral technique. Two ductile cast irons were investigated; they had similar volume fractions of graphite, graphite nodule sizes, and ferrite grain sizes. One, however, contained approximately 15% pearlite, while the other had less than 1% pearlite. The alloy with greater pearlite content exhibited higher strength and higher ductile-to-brittle transition temperature. Although cast irons are generally perceived as being low in toughness, the toughness values measured on fully ferritic nodular iron were quite high (K/sub IC/ = 80 to 106 MPa(INTEGRAL) m or 73 to 96 ksi(INTEGRAL) in from -80 to 250 C). DOE

N84-10295# Pacific Northwest Lab., Richland, Wash.
IMPROVED CORROSION RESISTANCE OF FINE-GRAINED 304 STAINLESS STEEL IN H20-CO-CO2-N2 ATMOSPHERES
J. T. Prater and D. R. Baer Nov. 1982 12 p refs Presented at the Corrosion in Fossil Fuel Systems Symp., Detroit, 17-22 Oct. 1982
(Contract DE-AC06-76RL-01830)
(DE83-013755; PNL-SA-10400; CONF-821015601) Avail: NTIS HC A02/MF A01

Fine-grained sputter-deposited 304 stainless steel (4 (SIGMA)m grain diameter), and, for comparison conventional wrought samples (40 (SIGMA)m grain diameter) were exposed to H2S-CO-CO2-N2 gas mixtures as 9500 C. Weight gains for the fine-grained material were much less than those for the wrought alloy. The chromium-rich oxide that formed on the fine-grained material was very resistant to the severe form of localized sulfidation attach experienced by larger-grained alloys. This localized attack resulted from oxide cracking during early stages of scale growth. Scale failure in the fine-grained alloy was related to iron diffusion to the cutter scale. Eventually a thick layer of iron sulfide formed which results in scale spallation during thermal cycling. A complementary in situ Auger-electron-spectroscopy study was conducted which showed that iron diffusion through the oxide scale was preferentially enhanced by the presence of sulfur. The stages of scale development were described for the fine-grained material. DOE

N84-10296# Argonne National Lab., Ill.
EFFECT OF OXYGEN MONOLAYER COVERAGES ON TITANIUM SPUTTERING YIELDS AS DETERMINED BY SIMULTANEOUS LASER FLUORESCENCE AND AUGER MEASUREMENTS
M. J. Pellin, C. E. Young, M. H. Mendelsohn, D. M. Gruen, R. B. Wright, and A. B. DeWald (Georgia Inst. of Tech., Atlanta) 1982 21 p refs Presented at 5th Intern. Conf. on Plasma Surface, Gatlinburg, Tenn., 3 May 1982
(Contract W-31-109-eng-38)
(DE83-014716; CONF-820545-23) Avail: NTIS HC A02/MF A01

The presence of an oxide layer can strongly influence the charge state of species ejected from ion bombarded metal surfaces, as well as the total sputtering yield. These quantities directly affect the influx of metallic impurities from the wall region into the plasmas of fusion devices. Surface coverage can also modify the distribution of sputtered atoms among electronic states and thus the apparent impurity density detected by the laser fluorescence spectroscopy (LFS) technique. The measurements reported here provide LFS data on number density and electronic state populations for the species Ti and Ti(+) as a function of surface oxygen coverage in a laboratory apparatus providing for direct monitoring by Auger analysis. DOE

N84-10297# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
EFFECT OF POINT DEFECTS ON MECHANICAL PROPERTIES OF METALS Technical Progress Report, 1 Aug. 1982 - 31 May 1983
M. Meshii 1983 10 p refs
(Contract DE-AC02-76ER-01367)
(DE83-014989; DOE/ER-01367/149; COO-1367-147) Avail: NTIS HC A02/MF A01

Hydrogen interacts strongly with grain boundaries and lattice defects within grains. It appears that the binding energies of hydrogen with these defects (grain boundaries and other lattice defects such as dislocations and voids) are equal to or greater than the heat of hydrogen in iron. The two effects, namely hydrogen-grain boundary interaction and hydrogen defects interaction within a grain can separated by employing single crystal specimens and polycrystalline specimens prepared from the same iron. This approach is extremely important to untangle complex hydrogen effects which take place simultaneously and are sensitive to the impurities present in an iron specimen. DOE

N84-10298# Northwestern Univ., Evanston, Ill. Dept. of Material Science and Engineering.
INVESTIGATION OF MICROSTRUCTURAL CHANGES IN FERRITIC STAINLESS STEELS CAUSED BY HIGH-TEMPERATURE DEFORMATION Technical Progress Report, 1 Jul. 1982 - 1 Jul. 1983
J. R. Weertman Jul. 1983 9 p refs
(Contract DE-AC02-81ER-10960)
(DE83-015331; DOE/ER-10960/3) Avail: NTIS HC A02/MF A01

The high temperature mechanical behavior of a ferritic stainless steel, Fe9CrlMo modified by the addition of small amounts of V and Nb was studied. Small angle neutron scattering was used to investigate changes in its microstructure produced by service at elevated temperature. DOE

N84-10299# Los Alamos Scientific Lab., N. Mex.
MELTING OF METALS ABOVE 100 GPa
J. W. Shaner, J. M. Brown (Texas A and M Univ., College Station), and R. G. McQueen 1983 6 p refs Presented at the 9th ARAPT Conf., Albany, 24-29 Jul. 1983
(Contract W-7405-eng-26; Grant NSF EAR-81-09591)
(DE83-015261; LA-UR-83-2248; CONF-830763-6) Avail: NTIS HC A02/MF A01

The optical analyzer technique was used to determine the pressure at which shock compressed iron, tantalum and aluminum can no longer support a longitudinal elastic wave. At this pressure the release wave velocity drops to a value consistent with a calculated bulk sound velocity, indicating partial melting. At higher shock pressures, the bulk sound velocities follows a constant rho (BETA) model, where (BETA) is the Grueneisen parameter. With these measurements melting on the Hugoniot was identified, and three metals as drivers for similar experiments on other materials were calibrated. DOE

N84-10300# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CONTINUOUS ANNEALING OF A Fe/0.1C/0.45Si/0.1Mo DUAL-PHASE STEEL
J. S. Gau and G. Thomas Apr. 1983 31 p refs Presented at the 111th AIME Ann. Meeting,, Dallas, 14-18 Feb. 1982
(Contract DE-AC03-76SF-00098)
(DE83-015984; LBL-13961; CONF-820205-8) Avail: NTIS HC A03/MF A01

Several two phase annealing heat treatments were performed on a Nb and Mo microalloyed low carbon steel. Continuous intercritical annealing followed by water quenching produces a coarse ferrite-martensite structure that has the highest tensile strength of all heat treatments utilized. The high strength arises from a combination of the disperson hardening which occurs in ferrite and the presence of marteniste. It is concluded that the ferrite-forming elements Nb and Mo do not benefit hardenability in this steel for dual phase heat treatment, in thicknesses approx. 5 mm. DOE

N84-10301# California Univ., Livermore. Lawrence Livermore Lab.
CORROSION EVALUATION OF ALUMINUM 5083
S. C. Sanders Sep. 1982 57 p refs
(Contract W-7405-eng-48)
(DE83-015786; UCRL-53387) Avail: NTIS HC A04/MF A01

The results from the ASSET (exfoliation), NAWLT (weight loss after exposure to nitric acid), and stress corrosion cracking tests of aluminum 5083 used in pressure vessels are presented. Most of the corrosion work was done on commercial plate stock material from a process developed at Lawrence Livermore National Laboratory (LLNL), although some hemispheres (hemis) from both commercial and premium grade material were used in the asset evaluation. The hemis from commerical aluminum experienced severe exfoliation corrosion, while the premium material was left virtually unattacked. DOE

N84-10302# Bureau of Mines, Avondale, Md.
ACIDIC DEPOSITION AND THE CORROSION AND DETERIORATION OF MATERIALS IN THE ATMOSPHERE: A BIBLIOGRAPHY, 1880 - 1982
D. R. Flinn, S. D. Cramer, J. P. Carter, P. K. Lee, and S. I. Sherwood (National Park Service, Washington, D.C.) Jul. 1983 564 p
(PB83-236091; EPA-600/3-83-059) Avail: NTIS HC A24/MF A01 CSCL 11F

The bibliography contains more than 1300 article citations and abstracts on the effects of acidic deposition, air pollutants, and biological and meteorological factors on the corrosion and deterioration of materials in the atmosphere. The listing includes citations for the years 1950 to 1982, with selected citations for the years 1880 to 1949. The citations are catalogued by year in six sections for metallic materials - ferrous material, aluminum, copper, nickel, zinc and galvanized steel, and other metals - and six sections for non-metallic materials - masonary, stone and ceramics, elastomers, fabrics, paints, plastics, and other nonmetals. An author index and an index of chemical, biological, and meteorological variables are provided. GRA

N84-10303# Bureau of Mines, Avondale, Md.
UPDATED PROCESS FLOWSHEETS FOR MANGANESE NODULE PROCESSING
Benjamin W. Haynes, Stephen L. Law, and Riki Maeda May 1983 107 p refs
(PB83-226340; BM-IC-8924) Avail: NTIS HC A06/MF A01 CSCL 11F

The updated report contains detailed flowsheets and descriptions of the ive potential first-generation nodule recovery schemes now considered most likely to be used by industry; they are high-temperature and high-pressure H2SO4 leach, reduction and HC1 leach, and smelting and H2SO4 leach. The first three processes are three-metal recovery schemes (Cu, Ni, and Co) with the option of Mn recovery from the tailings. The remaining two processes are four-metal (Cu, Ni, Co, and Mn) recovery schemes. GRA

N84-10304# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics and Materials Development Div.
THE DETECTION OF PITTING CORROSION IN STAINLESS STEEL USING DOUBLE-LAYER ACTIVATION
J. Asher, R. F. A. Carnay, T. W. Conlon, N. J. M. Wilkins, and R. D. Shaw (British Nuclear Fuels Ltd., Cumbria) 1983 33 p refs (AERE-R-9751) Avail: NTIS HC A03/MF A01

A double layer activation technique was used to monitor the progress of corrosion of a Type 347 stainless steel in aqueous solution. In nitric acid solution, uniform corrosion and pitting were separately identified on the 'top grain' and 'end-grain' surfaces respectively of specimens prepared from rolled place. 'Bottle-shaped' pitting also was detected in chloride solution. A second stage of the work demonstrated that pitting could be detected with thick metal between the active surface and the detector using high energy gamma ray emitting isotopes. Author

N84-10305# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
SOME EFFECTS OF ANISOTROPIC ROUGHENING ON THE WETTING OF METAL SURFACES
M. G. Nicholas and B. McGurran Jun. 1983 24 p refs
(AERE-R-10976) Avail: NTIS HC A02/MF A01

The wetting of aluminium and copper surfaces by sessile drops of water at room temperature and of tin at 500 C in vacuum was observed to be affected by anisotropic roughening. Increasingly severe anisotropic roughening progressively decreased liquid flow in the normal direction and, ultimately, enhanced that in a parallel direction. Increasing the severity of roughening increased the eccentricity of the sessile drop contact areas but did not effect their size. The effect of the liquid-solid chemical interactions in the tin-copper system was to diminish but not negate the influence of substrate roughening. These influence of roughness on the normal direction flow and the eccentricity of the drop contact areas are interpreted in terms of models that visualize surface asperities as a series of energy barriers. Author

N84-10306# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics Div.
A FOURIER TRANSFORM TECHNIQUE WHICH MEASURES PHASE DELAYS BETWEEN ULTRASONIC IMPULSES WITH SUFFICIENT ACCURACY FOR THE DETERMINATION OF RESIDUAL STRESSES IN METALS
D. R. Allen and W. H. B. Cooper May 1983 51 p
(AERE-R-1093) Avail: NTIS HC A04/MF A01

A Fourier transform technique is described which measures phase delay using short duration pulses or impulses. The method of data analysis is described and some simple test functions are used to estimate the accuracy and reliability of the resulting phase delays. It appears that the inherent accuracy associated with this techniques is not much different from that of a zero cross-over technique using a chopped CW source and narrow band receiver.

The computer software used to fully automate the Fourier transform technique is described. The technique can be automated to give reliable measurements of phase delay which for various reasons is not always possible using the narrow band CW technique. Finally, measurements of ultrasonic phase delays for a 50 mm thick mild steel plate using the Fourier transform technique are given for compressional and shear waves with frequencies around 2MHz and 5MHz. Corresponding measurements of phase delay, using a chopped CW stimulus are shown to be in good agreement. Author

N84-10307# SRI International Corp., Menlo Park, Calif.
MICROKINETICS OF STRESS-CORROSION CRACKING IN STEM-TURBINE DISC ALLOYS Interim Report
R. D. Caligiuri, L. E. Eiselstein, D. R. Curran, and D. A. Shockey Apr. 1983 73 p refs Sponsored by Electric Power Research Inst.
(DE83-902290; EPRI-NP-3005) Avail: NTIS HC A04/MF A01

A constant load test was developed to produce intergranular stress corrosion cracking similar to that which occurs in the low pressure steam turbines of nuclear and fossil-fuel power plants. The testing was done on A471 steel turbine disc specimens at engineering stresses ranging from 70% to 108% of the yield strength (869 MPa or 126 ksi) at 1600 C in deoxygenated 10% NaOH. The mean time to failure increased exponentially as the stress level is reduced. Tests at three stresses (828, 897, 932 MPa or 120, 130 and 135 ksi) were stopped at various fractions of the expected time to failure and the cumulative crack size distributions measured. Crack nucleation rates of about 10(3) cracks/sq m were found to be weakly dependent on stress, as might be expected for a stress corrosion cracking mechanism controlled by stress assisted diffusion along prior austenite grain boundaries. The growth rates were on the order of 10(+1)0m/s, and were much more strongly dependent on stress. The failure time increased as the prior austenite grain size increased. DOE

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-10308# British Library Lending Div., Boston Spa (England).
POLYMERISATION OF ACROLEIN AND ITS DERIVATIVES. 2: POLYMERISATION OF ACROLEIN AND ALPHA-ALKYL SUBSTITUTED ACROLEIN IN THE PRESENCE OF METALLIC SODIUM
M. M. Koton, I. V. Andreeva, and Yu. I. Getmanchuk 11 Aug. 1983 4 p refs Transl. into ENGLISH from Vysokomol. Soed. (USSR), v. 4, no. 10, 1962 p 1537-1540
(BLL-M-28708-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The acrolein molecule which are not directly linked to each other. This specific molecular structure is sometimes of theoretical as well as practical intenest. The conjugation of the C=C double bond with the carbonyl group, namely 1CH2=2CH-3CH=4o in acrolein results in acrolein acting like a diene in the Diels-Alder reaction. If one examines the structure of acrolein with this in mind, the chance of manufacturing acrolein polymers with different structures, with chiefly 1,2-, 3,4- and 1,4- bonds, becomes clear. Author

N84-10309# British Library Lending Div., Boston Spa (England).
STUDY OF FACTORS LEADING TO REGROUPING OF THE CHAIN STRUCTURE DURING IONIC DIENE POLYMERIZATION
B. A. Dolgopolsk 11 Aug. 1983 7 p refs Transl. into ENGLISH from Intern. Cymp. Macromol. Chem. (Moscow), v. 2, 1960 p 346-354
(BLL-M-28719-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The polymerization of dienes with lithium organic compounds produces polymers with a large content of 1:4-bonds (up to more than 90%). The addition of complexing agents (like other, sulphides, etc.) considerably increase the amount of 1:2- (and 3:4-) bonds. Changes in the composition of isomeric forms of a low molecular weight were observed /1/ during the study of organo-lithium compounds. A mixture consisting of crotyl lithium and 3-lithium-1-butene in a hydrocarbon solvent gives on decomposition a mixture of 1- and 2-butene at a ratio of 1:1. However, when the same mixture is decomposed in the presence of ether the resultant mixture of butenes is at a ratio of 5:1. These results have led to the conclusion that reaction conditions have a marked effect on the equilibrium of isomeric forms of organo-metal, allyl-type compounds. Wittig /2/ has found that organo lithium compounds are present in solution in a dimerized state. It is quite possible that sometimes an isomerization will occur in which one of the dimer molecules is converted to the isomer while the other remains unchanged. Author

N84-10310*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESIN SELECTION CRITERIA FOR TOUGH COMPOSITE STRUCTURES
C. C. Chamis and G. T. Smith 4 May 1983 33 p refs Presented at 24th Structures, Structural Dyn. and Mater. Conf., Lake Tahoe, Nevada, 2-4 May 1983; sponsored by AIAA, ASME, ASCE and AHS Original language document previously anoounced as A83-29734
(NASA-TM-83449; E-1762; NAS 1.15:83449) Avail: NTIS HC A03/MF A01 CSCL 11G

Resin selection criteria are derived using a structured methodology consisting of an upward integrated mechanistic theory and its inverse (top-down structured theory). These criteria are expressed in a 'criteria selection space' which are used to identify resin bulk properties for improved composite 'toughness'. The resin selection criteria correlate with a variety of experimental data including laminate strength, elevated temperature effects and impact resistance. Author

N84-10311# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
RUBBER MIXTURE SOFTENER: A PRODUCT OF THERMAL BREAKDOWN OF SUBSTANDARD POLYSOPRENE
I. B. Larina 1982 4 p Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 9, 1980 p 29-30
(CSIR-Trans-1649) Avail: NTIS HC A02/MF A01

The possibility of using a tire tread mixture plasticizer based on SKI-3 and SKD as a product of thermal breakdown of substandard polyisoprene (PTDP) was investigated. Fifty-five per cent by mass of PTDP was mixed with PM-100 technical carbon in a tyre tread mixture based on SKI-3 and SKD (70:30), at 5 - 15 parts by mass of PTDP/PM-100 mixture to 100 parts by mass of rubber (in plce of PN-6s oil). The mixture was prepred in a laboratory rubber mixer according to standards acceptable in the rubber industry and vulcanized at 153 C for 30 min. The standard mixture containing PN-6s oil as softener was also tested for comparison. N.W.

N84-10312# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
VULCANIZATE STRUCTURE OF ISOPRENE CHLOROPRENE RUBBER COMBINATION
Ju. I. Ljakin 1982 7 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 4, 1981 p 14-16
(CSIR-Trans-1646) Avail: NTIS HC A02/MF A01

The physical and mechanical properties of vulcanizates and rubber articles are determined largely by the interface polymer interactions in these systems. The interface interactions were evaluated by the methods of hydrostatic suspension and stratification of plied-up vulcanizate samples. The hydrostatic suspension permits assessment of the rubber interface interactions and of quantitative method change in the degree of crystallinity associated with changes in one specific volume of the vulcanizates with stretching. The increase of a specific volume is accompaned by the formation of vacuoles around the second phase particles in

the rubber medium. The decrease in specific volume is explained by crystallization. In order to decrease the effect of undissolved ingredients in the rubber by the specific volume of the vulcanizate SKI-3, the proportion of SKI-3 combining the PH in the formation of the rubber mixture, and the zinc oxide content were reduced. The vulcanizate strength was then determined, yielding more accurate data on the degree of modification of the crystallinity of the rubber. Author

N84-10313# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF MODIFYING ADDITIVES ON THE PROPERTIES OF POLYMER BLENDS
F. G. Gilimjanov 28 Oct. 1983 7 p refs Transl. into ENGLISH of "Vlijanie Modificirujuscih Dobavok na Svoistva Polimernyh Kimpozicii" (USSR), Rept. LT/QB, Nov. 1982
(CSIR-1690) Avail: NTIS HC A02/MF A01

The effect of mixing time, displacement rate and surfactant concentration on the phase structure of PELD-PS mixtures is examined. The test mixture consisted of 4 parts of PELD with PTR 2 and 1 part of brand PSMD PS, with 0,2% by mass of thermal stabilizer added. The modifying additives were calcium stearate and zinc stearate and isoprene block polymer with styrene (IST-30). The polymer mixture was prepared by the method of mechanical mixing of the constituents using a Benber laboratory mixer at 150 to 160 C and with a temperature also of 150 to 160 C between the discs. The mixing was checked by determination of the mean diameter and relative specific surface of the PS particles was checked by stereometric metallography using an MKM-8 metallographic microscope. A constant increase in the relative surface of the PS particles is observed after 30 min of mixing of the PELD and PS (at a constant rate of displacement). However, dispersion is much more rapid initially than after 15 to 20 min of mixing. S.L.

N84-10314# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
THEORETICAL CALCULATION OF THE TEMPERATURE DEPENDENCE OF THERMAL CONDUCTIVITY OF GLASS
V. I. Primenko 1982 6 p refs Transl. into ENGLISH from Steklo i Keram (USSR), v. 37, Pt. 5, 1980 p 17-18
(CSIR-Trans-1686) Avail: NTIS HC A02/MF A01

Calculation of optimum glass treatment conditions is based on data relating to the thermal conductivity of glass over a wide range of temperatures. There are no references in the literature to the thermal conductivity of glass at temperatures above 100 C. The experiment described below concerns the thermal conductivity of silicate glass in the 0 to 600 C temperature range and involves the calorimetric method. Author

N84-10315*# National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATIONS INTO THE BURNING-OUT OF ORGANIC SUBSTANCES IN THE CERAMIC BODY
C. Locher, E. Pfaff, P. Schulz, and C. Zografou Jun. 1983 14 p refs Tranl. into ENGLISH from Keramische Z. (West Germany), v. 34, no. 7, 1982 p 361-364 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77065; NAS 1.15:77065) Avail: NTIS HC A02/MF A01 CSCL 11B

Pressed compacts were made of spray dried alumina containing water soluble polyvinyl alcohol or cellulose derivative binder. The burning out of organic binder on gradual heating was investigated by visual and microscopic observations of the cross section and by thermogravimetry. Burning out proceeds inward from the peripheries, gradually reducing the size of the black core, which first consists of a dark boundary layer and later turns uniformly black with a sharp boundary. A detailed mechanism of the burning out process between and within the spray dried granules is observed under the microscope. Oxygen atmosphere accelerates the burning out process. Author

N84-10316# Rockwell International Corp., Thousand Oaks, Calif. Structural Ceramics Group.
RESEARCH ON MICROSTRUCTURALLY DEVELOPED TOUGHENING MECHANISMS IN CERAMICS Final Report, 1 Jun. 1977 - 31 May 1983
D. J. Green Jun. 1983 50 p refs
(Contract N00014-77-C-0441)
(AD-A130394; SC5117.14FR; TR-17; TR-18; TR-19) Avail: NTIS HC A03/MF A01 CSCL 11/2

An approach is presented for predicting the strengthening of brittle materials by compressive surface stresses. The approach incorporates the effect of crack closure, which can significantly influence the stress intensity factor. The analysis is used for the example of tempering and it is found that the results give a better understanding of crack growth but also indicate approaches for optimization of the strengthening. Compressive surface stresses can be introduced into transformation-toughened Zr02 ceramics by grinding or impact. These techniques usually have associated damage effects. A new approach is introduced whereby surface compression is introduced by a heat treatment, which involves the removal of the oxide additives, that were originally introduced to retain the Zr02 in its tetragonal phase, from the surface region. The presence of the compressive surface stresses is confirmed and the ensuing improved resistance to indentation cracking is described. Author (GRA)

N84-10317# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
POLYMERIC MICROELECTRONICS Final Report, May 1980 - Dec. 1982
Stephen T. Kowel, Dennis S. Cleverly, I. H. Loh, Edward Balizer, George C. Martin, and Philipp G. Kornreich 1 Jun. 1983 167 p refs
(Contract DAAK70-80-C-0053; Grant NSF ECS-78-21062; DA Proj. 1L1-62709-DH-95)
(AD-A130523; TR-83-13) Avail: NTIS HC A08/MF A01 CSCL 11/9

This report contains the results of more than two years' effort to examine applications for microelectronics and integrated optics of several classes of organic materials. The first class was ultraviolet curable elastomers; the second was liquid crystals. The principal goal of studying the elastomers was to create microstructures that could be electroded and deformed under applied voltage. Although theoretical calculations indicated that deformations of as much as 20 percent could be obtained, experimental values fell far short of this. However, as a result of this work it was learned that such materials as polydimethylsiloxane (PDMS) could be electroded with conductive and reflective metallic films by evaporation at low temperatures. Author (GRA)

N84-10318# Brown Univ., Providence, R. I. Dept. of Chemistry.
VIBRATIONAL SPECTRA OF SINGLE AND MIXED ALKALI PENTASILICATE GLASSES
Efstratios I. Kamitsos and William M. Risen, Jr. 20 May 1983 40 p refs
(Contract N00014-75-C-0883; NR Proj. 051-539)
(AD-A130527; TR-83-02) Avail: NTIS HC A03/MF A01 CSCL 07/4

The far infrared and laser Raman spectra of single and mixed alkali pentasilicate glasses, M20.5Si02 (M = Na, K, Rb, Cs), and xCs20(1-x)Na20.5Si02 are reported in both the annealed and unannealed forms. Study of the cation-motion bands in the far infrared shows that the vibrationally significant cation-network interactions are unaffected by either introduction of a second cation or by annealing, and these results are discussed in terms of the glass formation and annealing. The spectra of the network show the existence of intrinsic network strain, changes in distributions of bond angles related to alkali mixing and annealing, and evidence for the nature of the distribution of cations in the glass. The results are discussed in relation to the composition dependence of other properties of these and related mixed alkali glasses. Author (GRA)

N84-10319# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 71.

DURABLE COPPER POLYIMIDE ADHESIVE BONDS

Edward B. Murphy, Allan E. Mason, and Edward S. Wainwright 24 May 1983 31 p refs

(Contract F19628-80-C-0002; AF Proj. 649L)

(AD-A130221; ESD-TR-83-021; TR-652) Avail: NTIS HC A03/MF A01 CSCL 13/8

With an optimum chemically converted surface on copper, durable structural oadhesive bonds can be produced. By this particular alkaline oxidizing formulation and post-sealing, excellent structural bonds, which are both thermally and chemically stable, are achieved. The stability of these oxidized surfaces has been demonstrated through extensive tensile lap shear, interlaminar shear testing, and verifying peel tests. Although bonding has been primarily evaluated with a polyimide adhesive, the effect of the hot alkaline oxidizing solution on epoxy fiberglass substrates was explored using the ASTM interlaminar shear bending test and electrical resistance comb pattern. Quantitative analytical procedures for constituents in the alkaline oxidizing bath are described. GRA

N84-10320# Army Materials and Mechanics Research Center, Watertown, Mass.

THE DICYANDIAMIDE CURE OF SP-250 EPOXY RESIN ACCELERATED BY MONURON Final Report

Bernard R. LaLiberte and Robert E. Sacher Apr. 1983 22 p

(DA Proj. 1L1-62105-AH-84)

(AD-A129667; AMMRC-TR-83-17) Avail: NTIS HC A02/MF A01 CSCL 11/9

The synergistic effect of dicyandiamide and Monuron which takes place in the hardening of epoxy resins was investigated by differential scanning calorimetric analysis conducted under dynamic conditions. The cure behavior was illustrated by the examination of three distinct systems: SP-250 epoxy resin + dicyandiamide (Dicy), resin + Dicy/Monuron, and resin + Monuron. The activation energies of these systems were found to be 39, 22, and 19 kcal/mole, respectively. The by-product of the resin + Monuron reaction is dimethylamine and it was found that this amine is able to enhance the reactivity of dicyandiamide dramatically. Mixtures pertinent to the SP-250 formulation were examined and the interpretation of the thermal data afforded certain speculations. Author (GRA)

N84-10321# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.

STRUCTURE AND PROPERTIES OF POLYMERS AND ORGANOSILANES ADSORBED ONTO OXIDIZED ALUMINUM AND TITANIUM Annual Report, 1 Jul. 1982 - 30 Jun. 1983

F. James Boerio 15 Jul. 1983 37 p refs

(Contract N00014-80-C-0733; NR Proj. 039-202)

(AD-A130753; AR-3) Avail: NTIS HC A03/MF A01 CSCL 13/8

The molecular structure of thin films formed by gamma-aminopropyltriethoxy-silane (gamma-APS) adsorbed from aqueous solutions onto titanium, aluminum, and iron was determined and related to the properties of the films as primers for improving the wet strength of adhesive bonds between epoxy resins and titanium, aluminum, and iron adherends. Gamma-APS was adsorbed onto iron and titanium as hydrolyzed oligomers that condensed during drying to form polysiloxane films. The structure of the films was not significantly affected by the substrate or the pH of the gamma-APS solutions. Gamma-APS films were effective primers for improving the wet strength of titanium/epoxy and iron/epoxy lap joints. However, the properties of the films as primers depended strongly on the substrate and the pH of the solutions. It was concluded that the properties of the films depeneded more on the orientation of the gamma-APS molecules at the oxide surface than on the overall structure of the films. The orientation of the adsorbed gamma-APS molecules was determined by the pH of the solutions and by the isoelectric point of the oxides on titanium and iron. GRA

N84-10322# Defence Research Establishment Suffield, Ralston (Alberta).

COMPARATIVE TESTING OF POLYMER SOLUTIONS. PART 1: PRELIMINARY EVALUATION OF A RHEOMETRICS FLUIDS RHEOMETER

S. J. Armour and M. D. Gauthier May 1983 40 p refs

(AD-A130888; DRES-365) Avail: NTIS HC A03/MF A01 CSCL 07/4

A comparison round of testing was organized to provide DRES with a low viscosity secondary standard for the measurement of viscosity and first normal stress difference in steady shear. The current performance of the Rheometrics Fluids Rheometer, recently purchased by DRES, is compared with that of other Fluids Rheometers, with Weissenberg R-18 Rheogoniometers, with Instron Rotary Rheometers, and with concentric cylinder viscometers manufactured by Haake and Brookfield. GRA

N84-10323# Iowa Univ., Iowa City. Hygienic Lab.

STABILIZATION OF THE SOLVENT METHYL-n-AMYL KETONE (MAK) IN VINYL PAINTS Final Report

Armand F. Lange and Alfred D. Beitelman Champaign, Ill. CERL Jun. 1983 22 p refs

(AD-A131059; CERL-TR-M-331) Avail: NTIS HC A02/MF A01 CSCL 11/3

This research was conducted to devise a way to eliminate the formation of acids during storage of vinyl paint by controlling the acidity of its solvent-methyl-n-amyl ketone (MAK). MAK was found to break down under organic acid catalyzed conditions. The decomposition products, acetic and pentanoic acids, were formed by an oxidation reaction. The reaction is autocatalytic, since the products formed are the catalysts for further reaction. 2-ethyl hexanoic acids was found in the original MAK, but was not produced by the organic-acid-catalyzed oxidation. Under most chromatographic conditions, pentanoic acid would elute very close to MAK and therefore would not be detected. The reaction products suggest that a peroxide is involved in the oxidation. Inhibitors which would eliminate peroxide formation were tested as stabilizers for MAK. Ethanol was found to stabilize MAK to a limited extent. Other inhibitors tested which were successful were 2,2-tris (dimethylaminoethyl) phenol. These are all peroxide inhibitors. It is recommended that any of these inhibitors be used with ethanol in the final paint formulation. Author (GRA)

N84-10324# Battelle Columbus Labs., Ohio.

HOT ISOSTATIC PRESSING OF CERAMIC POWDER COMPACTS Annual Report, Jun. 1982 - Jun. 1983

R. R. Wills, J. K. McCoy, A. J. Markworth, L. G. McCoy, and L. E. Muttart 28 Jun. 1983 97 p refs

(Grant AF-AFOSR-0238-82; AF Proj. 2306)

(AD-A131514; AFOSR-83-0669TR; AR-1) Avail: NTIS HC A05/MF A01 CSCL 11/2

Several mechanisms contribute to the densification of ceramics during HIP. These can potentially be related to the kinetics of densification by the use of mechanism maps and a predictive methodology derived for determining parameter selection during HIP. The constitutive equation for final stage densification have been critically examined in terms of their underlying assumptions and the effects of changes in pore size, grain size, temperature, pressure, diffusion coefficient, density and the presence of residual gas pressure. A new algorithm for calculating and plotting mechanism maps has been derived. This algorithm reduces the number of data points needed to construct a complete map be a factor of 30. Initial experiments performed at 1100 C and 102 MPa (15,000 psi) showed that a very small amount of grain growth occurred. Correlation of the experimental data with the theoretical predictions is quite good; if it is assumed that 1% residual porosity is a result of entrapped gases then excellent agreement between theory and experiment exists. Although the constitutive equations are supposed to be most applicable during the latter stages of densification, good agreement exists throughout the whole densification range. GRA

N84-10325# L'Garde, Inc., Newport Beach, Calif.
GEOTHERMAL ELASTOMERIC MATERIALS TECHNOLOGY TRANSFER (GEM-TT) PROGRAM Final Report
A. R. Hirasuna, G. J. Friese, and C. A. Stephens Dec. 1982 228 p refs
(Contract DE-AC02-76CH-00016)
(DE83-013118; BNL-32936) Avail: NTIS HC A11/MF A01

The primary objective, to promote broad use of the earlier developed elastomers technology appears to have been successfully accomplished. The expertise was transferred to three rubber products manufacturers, and is currently commercially available. Significant substantiation of the viability of the technology was fostered through supporting and tracking numerous test efforts in various industry laboratories and out in the field. Numerous papers were presented on the technology and information was also disseminated verbally and by providing data packages. The formal and informal technology transfer effort are described. Several secondary spin-offs also resulted. Steps toward a better understanding of the complex technology transfer process were achieved. The experience provides a data point illustrating one way that technology transfer can be accomplished and a data point which can be used to evaluate its effectiveness. And finally studies were made assessing the potential of elastomers to perform at even higher temperatures. DOE

N84-10326# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF ALTERNATE SILICONE POTTING COMPOUNDS. VOLUME 11: INFLUENCES OF TEMPERATURE, MATERIAL VARIABLES AND COMPOSITION VARIABLES ON THE PROPERTIES OF SUBSTITUTE POTTING COMPOUNDS
W. E. Cady Jan. 1983 75 p refs
(Contract W-7405-eng-48)
(DE83-013025; UCRL-52434-Vol-11) Avail: NTIS HC A04/MF A01

The effect that Sylgard 184 and 186 and Dielectric Gel Q3-6527 have on the mechanical properties of cured Sylgard starting materials, cured APC2.5, and APC10 substitute potting compounds was evaluated. The influences of five variables of 184, 186, and Q3-6527 on the 250C mechanical properties, namely temperature, platinum content of the accelerator, amount of accelerator used, reactivity, and viscosity were specifically studied. Within limited ranges, the platinum content of the accelerator and the amount of accelerator used had no effect on the mechanical properties of cured silicones. The reactivity and viscosity of the major components (184, 186, and Q3) had only two slight effects on the mechanical properties and thermal stability of the cured APC compounds. Lot variations on Sylgards 184 and 186 and ingredient variations on APC2.5, 10, and 300 compounds were checked. Sylgards 184 and 186 vary from lot to lot, but the variability is moderate and of the same magnitude as testing variability. DOE

N84-10327# Georgia Univ., Athens. Dept. of Chemistry.
EFFECTS OF SURFACE AREA AND PORE SIZE UPON LIQUID CHROMATOGRAPHIC FRACTIONATIONS OF POLYSTYRENE OLIGOMERS USING ETHYLPHENYL DERIVATIZED SILICAS
William A. Howard, Tau-Being Hsu, and L. B. Rogers Jun. 1983 30 p
(Contract DE-AS09-76ER-00854)
(DE83-014632; DOE/ER-00854/40) Avail: NTIS HC A03/MF A01

Oligomers of 800 and 2200 MW polystyrene were separated on ethylphenyl derivatized silicas. The effects of surface area, pore size, sample loading and functionality of the silica surface upon oligomer separations were examined. Particle size, end-capping and polymerization of the silane were held constant. Silicas having small pores and high surface area yielded the best separation. Also, ethylphenyl was better than n-octyl for separating 800 MW polystyrene oligomers. DOE

N84-10328# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
RESEARCH NEEDS FOR THE USE OF POLYMER COATINGS FOR CORROSION PROTECTION
Harland G. Tompkins 1983 14 p NSF Workshop on Long-Range Res. Opportunities for Substituting Non-Metallic Mater. for Vulnerable Minerals, Washington, D.C., 27 Jun. 1983
(Contract DE-AC07-76ID-01570)
(DE83-015443; EGG-M-09983; CONF-830676-1) Avail: NTIS HC A02/MF A01

Polymer applications are considered, and research methods are discussed. Benefits of developing coatings for corrosion protection are described. DOE

N84-10329# Sandia Labs., Albuquerque, N. Mex.
SOL-GEL TRANSITION IN SIMPLE SILICATES, 2
C. J. Brinker, K. D. Keefer, D. W. Schaefer, R. A. Assink, B. D. Kay, and C. S. Ashley 1983 31 p refs Presented at the 2nd Intern. Workshop on Glasses and Glass Ceramics from Gels, Wuerzburg, West Germany, 30 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013975; SAND-82-2213C; CONF-830668-1) Avail: NTIS HC A03/MF A01

Silica gels were prepared from alcoholic solutions of tetraethyl orthosilicate (TEOS) using a two step hydrolysis process; small angle x-ray scattering (SAXS), gas-liquid chromatography, and (1) H NMH spectroscopy were employed to study their formation. The first step (1 mole H20/mole TEOS with HC1 catalyst) resulted in a rather wide species distribution comprised of hydrolyzed and unhydrolyzed monomers, dimers, and chains. The second step (additional water plus acid or base) resulted in completely hydrolyzed polymers in the acid system which apparently were highly overlapped prior to gelation. In the base system, hydrolysis was incomplete due to unhydrolyzed monomer and the resulting polymers were more highly condensed (or collapsed) and discrete compared to the acid system. The formation of colloidal silica was not observed in either case. DOE

N84-10330# National Bureau of Standards, Boulder, Colo.
TENSILE, COMPRESSIVE, AND SHEAR PROPERTIES OF A 64-kg/M3 POLYURETHANE FOAM AT LOW TEMPERATURES
J. M. Arvidson, L. L. Sparks, and Chen Guobang Feb. 1983 34 p refs Sponsored in part by Gas Research Inst.
(PB83-204818; NBSIR-83-1684) Avail: NTIS HC A03/MF A01 CSCL 11L

Polyurethane foam, having a density of 64-kg/cu m, was tested at 295, 111, 76, and 4 K. The material properties reported are Young's modulus, proportional limit, yield strength (at 0.2% offset), tensile, shear, and compressive strengths, and elongation (elastic and plastic). To perform these tests, a unique apparatus was developed. This apparatus permits tension, compression, and shear testing of materials at any temperature ranging from 295 to 1.8 K. Strain is measured with a concentric, overlapping-cylinder capacitance extensometer that is highly sensitive and linear in output.
Author (GRA)

N84-10331# Environmental Sciences Research Lab., Research Triangle Park, N.C.
RESEARCH PROGRAM FOR EFFECTS OF ACIDIC DEPOSITION ON MATERIALS AND CULTURAL RESOURCES
John W. Spence and Fred H. Haynie Jul. 1983 12 p refs
(PB83-232074; EPA-600/D-83-087) Avail: NTIS HC A02/MF A01 CSCL 11G

The framework of a research program to develop the methodology and data bases for assessing the material related benefits of acidic deposition control policies and guidelines for protecting or restoring individual structures especially historical and cultural sites is given. Seven basic areas of research are identified. J.M.S.

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-10332*# United Technologies Corp., East Hartford, Conn.
AN ASSESSMENT OF THE USE OF ANTIMISTING FUEL IN TURBOFAN ENGINES Contractor Report, Sep. 1979 - Mar. 1982
A. J. Fiorentino and J. R. Planell Oct. 1983 180 p refs
(Contract NAS3-22045)
(NASA-CR-168081; NAS 1.26:168081; PWA-5697-65) Avail: NTIS HC A09/MF A02 CSCL 21D

An evaluation was made on the effects of using antimisting kerosene (AMK) on the performance of the components from the fuel system and the combustor of current in service JT8D aircraft engines. The objectives were to identify if there were any problems associated with using antimisting kerosene and to determine the extent of shearing or degradation required to allow the engine components to achieve satisfactory operation. The program consisted of a literature survey and a test program which evaluated the antimisting kerosene fuel in laboratory and bench component testing, and assessed the performance of the combustor in a high pressure facility and in an altitude relight/cold ignition facility. Author

N84-10333# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
LIQUID CHROMATOGRAPHIC ANALYSIS OF NITROCELLULOSE-BASE PROPELLANTS Final Technical Report
James G. Carver 28 Mar. 1983 32 p
(AD-A129005; DRSMI/RK-83-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

A procedure has been developed that is able to predict the optimum conditions for separation of the ingredients of a complex mixture by liquid chromatography. The procedure involves establishing a data base of retention times for a large number of propellant ingredients in 7 predetermined combinations of 3 solvents. When a new combination of some of these ingredients is encountered, a computer analysis of the retention times of the ingredients from the data base will predict the best solvent composition to separate all the ingredients. The details of the procedure and several examples of its use are discussed. Author (GRA)

N84-10334# Ashland Petroleum Co., Ky. Research and Development Div.
REFINING OF MILITARY JET FUELS FROM SHALE OIL. PART 4. PROCESS COMPUTER MODELING STUDIES Final Report, 1 Jun. - 30 Sep. 1981
H. F. Moore and R. P. Long Wright-Patterson AFB, Ohio AFWAL Aug. 1982 99 p refs
(Contract F33615-78-C-2080)
(AD-A128891; AFWAL-TR-81-2056-Pt-4) Avail: NTIS HC A05/MF A01 CSCL 21/4

An overall optimization study involving computer modeling of shale upgrading was performed in Phase 4. This study utilized the analytical and experimental data from Phase 1, 2, and 3 of the program. Computer modeling of the process was used to define an economic optimum configuration. The economic and yield trade-offs of producing either JP-4 or JP-8 aviation turbine fuels as the primary products were evaluated, along with a detailed analysis of the experimental data and definition of remaining problems. GRA

N84-10335# Mechanical Technology, Inc., Latham, N. Y.
AUTOMATIC COMBUSTOR CONTROLLER DEVELOPMENT AND LIQUID-FUEL COMBUSTOR DESIGN PROGRAM Final Report, Feb. 1981 - Sep. 1982
J. R. Killough, R. A. Lacey, T. M. Moynihan, and R. A. Farrell Wright-Patterson AFB, Ohio AFWAL Jan. 1983 121 p refs
(Contract F33615-81-C-2007; AF Proj. 3145)
(AD-A130368; AFWAL-TR-82-2120) Avail: NTIS HC A06/MF A01 CSCL 21/2

This technical report, prepared for the Aerospace Power Division, Aero Propulsion Laboratory, Wright-Patterson AFB, states design and test results of a combustor controller integrated with an existing 1kW free-piston Stirling engine. This report document also states the design of a liquid-fuel external heat system capable of operating with a 3kW free-piston Stirling engine. Author (GRA)

N84-10336# Coordinating Research Council, Inc., Atlanta, Ga.
LOW TEMPERATURE BEHAVIOR OF FUELS IN SIMULATED AIRCRAFT TANKS
May 1983 65 p refs
(AD-A130267; CRC-532) Avail: NTIS HC A04/MF A01 CSCL 13/4

Lockheed and Boeing each made a series of tests in aircraft fuel tank simulators to provide an improved understanding of the flowability and pumpability of jet fuels at or below their freezing point where waxy components separate. Each simulator represented a section of an aircraft wing fuel tank. Tests simulated the low temperature cruise environment associated with long duration flights under extreme, high-altitude conditions. Holdup, the fraction of unavailable fuel remaining in the tank after attempted fuel withdrawal, was used to characterize pumpability after low temperature exposure. The test fuels were derived from widely differing crude sources and were selected to cover a range of freezing points. Two of the test fuels were common to the Boeing and Lockheed investigations in order to assess variability due to simulator construction. One fuel in the Lockheed program contained a flow improver additive. In the Boeing program, one fuel was a blend of JP-5 and 9% marine diesel fuel. Author (GRA)

N84-10337# Southwest Research Inst., San Antonio, Tex. Fuels and Lubricants Reserch Lab.
RESEARCH ON FIRE-RESISTANT DIESEL FUEL FLAMMABILITY MITIGATION MECHANISMS Interim Report, 13 May 1980 - 31 Dec. 1982
W. D. Weatherford, Jr. and David W. Naegeli Dec. 1982 57 p refs
(Contracts DAAK70-80-C-0001; DAAK70-82-C-0001; DA Proj. 1T1-61102-AH-51)
(AD-A130743; AFLRL-165; SwRI-6800-111) Avail: NTIS HC A04/MF A01 CSCL 21/4

The development of aqueous fire-resistant diesel fuel (FRF) microemulsions has been reported previously. Flammability and ballistic tests reveal diminished mist flammability, and such tests demonstrate rapid self-extinguishment of pool fires even at temperatures above the base fuel flash point. A basic study has been conducted to develop an improved understanding of the mechanisms by which such self-extinction occurs. An ignition-limits apparatus was developed, utilizing an evacuatable autoclave at one atmosphere. Measurements made with diesel fuel vapor in air, diluted with various amounts of water vapor, established that such mixtures containing more than about 24 mole% water vapor cannot burn. Vapor pressure measurements, made in a modification of the same apparatus, confirmed that FRF systems containing 10 vol% water and 6 vol% surfactant are blanketed by equilibrium vapors containing at least 24 mole% water for liquid temperatures greater than about 70 C. The flash points of diesel fuel FRF blends containing 10% water are about the same as those of the base fuel when its flash point is less than about 70 C. When the base fuel flash point exceeds 70 C, no flash point is detectable for the FRF. GRA

N84-10338# Naval Surface Weapons Center, White Oak, Md.
ANALYSIS AND SYNTHESIS OF 1,2,4-BUTANETRIOL Final Report, Oct. 1979 - Sep. 1980
Frank J. Pisacane 8 Dec. 1982 60 p refs
(SF31332391)
(AD-A130875; AD-F500174; NSWC-TR-82-380) Avail: NTIS HC A04/MF A01 CSCL 19/1

Techniques have been developed for routine analysis of

1,2,4-butanetriol (BT) and related compounds, and a number of contaminants in commercial BT have been identified. To determine the nature and levels of contaminants that adversely affect the nitration process, trial nitrations have been run simulating actual conditions in the continuous nitration facility at the Naval Ordnance Station, Indian Head. Purification techniques were examined to improve the quality of commercially obtained BT, and several processes for BT synthesis were studied. GRA

N84-10339# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
THE USE OF FUEL ADDITIVES TO CONTROL PLUME OPACITY OF TURBINE ENGINE TEST CELLS Final Report, Mar. 1978 - Oct. 1981
O. M. Loveland, A. F. Klarman, James Tarquinio, and Terry L. Stoddart Apr. 1983 42 p refs
(AF Proj. 2054)
(AD-A130777; AFESC/ESL-TR-83-08) Avail: NTIS HC A03/MF A01 CSCL 21/2

This research, a joint Air Force/Navy study, evaluated the use of fuel additives to reduce the opacity of turbine engine test cell emissions. Automated smoke abatement system (ASAS) was used to inject ferrocene and XRG fuel additives into J57-43 turbine engines. Data obtained from this study indicate that ferrocene can be used to control test cell opacity without major impact on engine performance. The XRG fuel additive was not effective in reducing opacity. Major problems encountered with the ASAS were resolved during the project. Recommendations for further improvement of the ASAS were reported. Author (GRA)

N84-10340# Economic Assessment Service, London (England).
METHANOL PRODUCTION FROM NATURAL GAS OR COAL
A. Stratton, D. F. Hemming, and M. Teper Dec. 1982 58 p
(DE83-901909; EAS-E-4/82) Avail: NTIS HC A04/MF A01

The comparative economics of natural gas and coal as feedstocks for methanol production are examined. Currently, natural gas is the dominant feedstock - the gas is steam-reformed, its composition adjusted, and the resulting mixture of HZ, CO, and COZ catalytically synthesized. As natural gas becomes more expensive (e.g. in Europe and North America) coal may again become an attractive feedstock, for gasification to the required HZ, CO, and COZ mixtures. Author

N84-10341# Pacific Northwest Lab., Richland, Wash.
METHANOL PRODUCTION BY CATALYTIC GASIFICATION OF WOOD
M. D. Brown, D. B. Mitchell, L. K. Mudge, R. J. Robertus, and E. G. Baker Oct. 1982 7 p refs Presented at the 2nd Synthetic Fuels Symp., Energy Technol. Conf., and Exhibition, Houston, Tex., 30 Jan. - 2 Feb. 1983
(Contract DE-AC06-76RL-01830)
(DE83-013744; PNL-SA-10604; CONF-830108-6) Avail: NTIS HC A02/MF A01

A process to produce methanol from wood or other types of biomass by gasification with steam in the presence of a catalyst was developed. The methanol yield from this process is greater than processes using fixed gasification of wood. The gasification process was successfully demonstrated in a 25 kg/hr (50 lb/hr) plant. Operating costs and capital expenditures for plants producing between 180 and 1800 MT (100 and 1000 short tons) of methanol per day was determined. In the gasification process, dry biomass in the form of chips or fines is augered into a heated bed of catalyst particles which are fluidized by steam at 700 to 7500 C. The wood pyrolyzes, producing gases, condensible organic compounds and char. Char is gasified by steam, producing additional hydrogen and carbon monoxide. Condensible organic molecules are cracked by the catalyst, producing more gas. Essentially all organic compounds other than methane are destroyed. The energy for the reaction is provided by heat exchangers in the gasifier. This processing scheme requires no air separation plant and only minimal water treatment facilities.

N84-10342# Teledyne CAE, Toledo, Ohio.
GAS-TURBINE DEMONSTRATION OF PYROLYSIS-DERIVED FUELS Final Technical Report, Sep. 1978 - Jun. 1982
G. Jasas, J. Kasper, and R. Trauth Jun. 1983 116 p refs
(Contract DE-AC03-78ET-13333)
(DE83-013610; Teledyne-CAE-1901; DOE/ET-13333/T2) Avail: NTIS HC A06/MF A01

A potential nonpetroleum base alternate fuel for gas turbines was identified. This fuel is derived from agricultural and forestry products/wastes through a pyrolysis conversion. Three combustible products are produced: heavy oil, residual char, and gas. Blending of the char and oil products yields a two phase (slurry) fuel with a heating value that is approximately 85% of typical petroleum base fuels. The pyrolysis derived fuel slurry in a direct fired gas turbine application was evaluated. Test evaluations were carried out in a gas turbine combustor rig operated at approximately one-atmosphere inlet pressure. The pyrolytic fuel properties and characteristics were measured along with its effects on typical materials used in gas turbine engines. It is indicated that the process is technically viable with a potential of high combustion efficiency. Additional fuel properties refinement along with combustor and fuel handling modifications will be necessary to bring this technology up to threshold for commercialization. DOE

N84-10343# Brookhaven National Lab., Upton, N. Y. Materials Chemistry and Energy Conversion Div.
CARBONACEOUS ANODE DEPOLARIZERS FOR ELECTROLYTIC HYDROGEN PRODUCTION
James McBreen May 1983 16 p refs Presented at the IEA Workshop on Electrolytic Hydrogen Production, Ispra, Italy, 30 May - 1 Jun. 1983
(Contract DE-AC02-76CH-00016)
(DE83-013278; BNL-32964; CONF-830578-3) Avail: NTIS HC A02/MF A01

The use of coal as an anode depolarizer for electrolytic hydrogen production which included development of chemical treatments, screening of electrocatalysts and use of highly acid electrolytes to enhance the anode depolarization activity of coal was studied. Several electrocatalysts were identified for the oxidation of formic acid and formate. These included underpotential deposited metal monolayers on platinum and a Pt/Pd alloy. When the latter was used in a formate depolarized electrolyzer, hydrogen could be produced at a current density of 526mA/cm(2) and a cell voltage of 1.16V. Several chemical treatments of coal such as alkali carbonate hydrolysis, molten ZnCl2 treatments and the use of strongly acidic electrolytes enhance the anode depolarization activity of coal. The current density however is still low. It is indicated that compounds such as myristaldehyde and oleyl alcohol are formed during electrolysis. DOE

N84-10344# Brookhaven National Lab., Upton, N. Y.
OVERVIEW OF US ACTIVITIES IN IEA HYDROGEN TECHNOLOGY. ANNEX 4: ELECTROLYTIC HYDROGEN PRODUCTION
A. Mezzina May 1983 6 p refs Presented at IEA Workshop on Electrolytic Hydrogen Prod., Ispra, Italy, 30 May 1983
(Contract DE-AC02-76CH-00016)
(DE83-013064; BNL-32934; CONF-830578-1) Avail: NTIS HC A02/MF A01

Technical contributions are described for R and D efforts into: anode depolarization; high temperature electrolysis static feedwater electrolysis; and the implementing of plans for an integrated test bed for advanced H2 technology. The US rationale is presented for placing programmatic emphasis on base technology development applicable to the far term. DOE

N84-10345# Institute of Gas Technology, Chicago, Ill.
SYNTHETIC FUELS FROM US OIL SHALES: A TECHNICAL AND ECONOMIC VERIFICATION OF THE HYTORT PROCESS Final Quarterly Report, 1 Jan. - 31 Mar. 1981
Jan. 1983 212 p refs
(Contract DE-AC20-79ET-14102)
(DE83-005440; DOE/ET-14102/4; FQR-4) Avail: NTIS HC A10/MF A01

The objective is to fully demonstrate the technical and ecnomic feasibility of the HYTORT process as it applies to both Eocene and Devonian shales. Achievement of this objective will widen the nation's synthetic fuels resource base by adding a new resource, Devonian shale, to the list of possible feedstocks for a synthetic fuels industry. It will also establish a high-efficiency alternative to conventional retorting of Western oil shales. Progress reports are presented for the following five tasks of the HYTORT process development work: laboratory programs; bench-scale program; process development unit tests; process environmental assessment; and process design and economics. 48 figures, 37 tables. DOE

N84-10346# Dynatech R/D Co., Cambridge, Mass.
BIOREFINING OF SELECTED INDUSTRIAL WASTES TO LIQUID FUELS AND ORGANIC CHEMICALS Final Technical Progress Report, 15 Jun. - 31 Dec. 1982
P. F. Levy, A. P. Leuschner, and J. H. Stoddart, Jr. 27 May 1983 194 p refs
(Contract DE-AC02-82CE-40556)
(DE83-013910; DOE/CE-40556/T2; DTR-2238) Avail: NTIS HC A09/MF A01

The feasibility of processing industrial wastes to fuels or chemicals by a process incorporating anaerobic digestion and electrolytic oxidation was investigated. Various waste samples were collected and tested for their applicability to the process. In the process, waste material is fed to an anaerobic digester in which methane formaton is inhibited. This enhances formation of linear aliphatic carboxylic acids from acetic to hexanoic acid. The organic acids can be removed from the fermenter by liquid-liquid extraction and then converted to the final product by electrolytic oxidation. The product is dependent on the organic acid produced in the digestion step and the conditions of the electrolytic oxidation. The potential process products include linear alkanes (n-octane, n-decane), olefins (propylene, butenes), alcohols (propanol, pentanol), and esters (ethylacetate, propylbutyrate). The process is more sophisticated than methane production, but has a more valuable product. Reduction in wastewater BED and suspended solids (and thus a reduction in disposal costs) is similar to that for methane digestion. DOE

N84-10347# California Univ., Berkeley. Membrane Bioenergetics Group.
PRODUCTION OF HYDROGEN BY CYANOBACTERIA Annual Report, 1 Apr. 1982 - 31 Mar. 1983
L. Packer Mar. 1983 12 p refs Sponsored by Gas Research Inst.
(PB83-228379; GRI-81/0166) Avail: NTIS HC A02/MF A01 CSCL 07D

To understand the bioenergetics of H2 production by cyanobacteria new electron spin resonance (ESR) spectroscopic methods using nitroxide probes were developed for measuring the electrical and chemical components which affect H2 production. O2 inhibits H2 production. An ESR method was developed for measuring intracellular O2. Dark levels of reductants in the H2-producing cells rapidly reduced nitroxides; only O2 in the cells which conduct photosynthesis was measureable. Thus, nitroxide reduction provides a new method to study the pathway which removes O2. Nitrate inhibits H2 production. Nitrate uptake was found to be passive and sodium dependent in the dark. This is contrary to previous reports of active uptake and indicates that nitrate inhibition of H2 production is not due to its permeability. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-10348 Joint Publications Research Service, Arlington, Va.
USSR REPORT: SCIENCE AND TECHNOLOGY, NO. 19
7 Oct. 1983 111 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84497) Avail: NTIS HC A06

This serial report contains news items, astracts and articles of scientific reports on aspect of science and technology policy including trade agreements, efficient use of scientific potential, productivity, optical physics, new technology, and the production process. For individual titles, see N84-10349 through N84-10365.

N84-10349# Joint Publications Research Service, Arlington, Va.
TRADE AGREEMENTS ON KNOW-HOW DISCUSSED
A. Melnikov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 1-5 Transl. into ENGLISH from Khozyaystvo i Pravo (Moscow), no. 6, Jun. 1983 p 72-74 (For primary document see N84-10348 01-31)
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Under the conditions of the present scientific and technical revolution the thirst for possessing advanced production experience and knowledge has led to a significant increase in the number of agreements on the transmission of know-how as compared with license agreements, whose objects are patented scientific and technical achievements. As a rule, the All-Union Litsenzintorg Association concludes agreements on the transmission of know-how in the USSR. A number of other foreign trade associations also conclude such agreements. In accordance with their charters operations are performed for the transmission of know-how, when the latter form an integral part of agreements on the export or import of goods based on the products list of these associations. An analysis of the terms of agreements on the transmission of know-how shows that the rights and duties of the parties to the agreement coincide in large measure with the rights and duties of the licensor and licensee according to the license agreement. Author

N84-10350# Joint Publications Research Service, Arlington, Va.
MEASURES TO STEP UP PRACTICAL USE OF SCIENTIFIC WORK DISCUSSED
V. Khodzhimatov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 6-12 Transl. into ENGLISH from Ekon. i Zhizn (Tashkent), no. 5, May 1983 p 32-36 (For primary document see N84-10348 01-31)
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To achieve significant acceleration of scientific-technical progress and bring all sectors of the economy to the most advanced frontiers of science and technology was proposed as one of the paramount tasks of our time. Much was done by scientists of Uzbekistan for the development of the multisectorial economy of the republic and for the creation of progressive technology in industry, capital construction, and in agriculture, especially in cotton production. Every year scientific organizations complete and turn over for practical use more than 33 different development projects with an economic impact of more than 600 million rubles. Thanks to their introduction, technical equipmentation has grown, technological processes were improved, the volume of production has increased, and the quality of output has improved. Author

N84-10351# Joint Publications Research Service, Arlington, Va.
EFFECTS OF SCIENCE, TECHNOLOGY ON STRUCTURE OF PRODUCTION PROCESS
Ye. A. Skoblikov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 13-31 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Ekon. (Moscow), no. 3, 1983 p 40-52 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

The structure of the production process, patterns in its organization and the classification of production processes are considered. On the basis of an analysis of the dialectrical interconnection among stages of the production process - preparation and direct production - and the singling out of the type of production systems and the stages of their development, the organizational content of the scientific and technical revolution is determined. Practical recommendations are given for improving the organizational structure of industry. Author

N84-10352# Joint Publications Research Service, Arlington, Va.
SUCCESSES, SHORTCOMINGS IN USING PRODUCTION WASTES AS RAW MATERIAL
L. Glushenkova *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 32-37 Transl. into ENGLISH from Prom. Belorussii (Minsk), no. 5, May 1983 p 40-43 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

The economical and rational use of all forms of resources under modern conditions is a task of nationwide significance. Its urgency is caused by factors such as the progressively growing need for raw material, fuel, energy, and supplies, the limited and non-renewable nature of many minerals, and the difficult conditions of mining them and transporting them to where they are needed. Author

N84-10353# Joint Publications Research Service, Arlington, Va.
USE OF SCIENTIFIC POTENTIAL IN INDUSTRY DISCUSSES
K. Shakirov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 38-40 Transl. into ENGLISH from Ekon. i Zhizn (Tashkent), no. 2, Feb. 1983 p 32-33 (For primary document see N84-10348 01-31)
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The practical application of results of basic research, which are considered to be concentrated in scientific establishments of the Academy of Sciences, general technical establishments, and sectorial higher educational institutions in the republic are discussed. Today they are deservedly viewed as a component part and, moreover, as the leading part of the scientific potential of physical production sectors. These scientific systems have begun to work closely on current national economic and sectorial problems as a result of consistent implementation of the party's course toward an integral combination of science, technology and producton. The Experiment Plant Biology Institute and the Physical Technical Institute of the Uzbek SSR AN (Academy of Sciences), the Tashkent Polytechnical Institute and the Tashkent Agricultural Irrigation and Mechanization Institute are working productively in this direction, but the level of use of end results of the scientists' activity still cannot be considered sufficient. Author

N84-10354# Joint Publications Research Service, Arlington, Va.
DESIGNERS VOICE COMPLAINTS, SUGGESTIONS REGARDING THEIR WORK
Vasiliy Parfenov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 41-46 Transl. into ENGLISH from Pravda (Moscow), 7 May 1983 p 2 (For primary document see N84-10348 01-31)
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An assessment by designers is made of the transfer of scientific discovery to industrial products. The acceleration of scientific and technical progress was also examined. B.G.

N84-10355# Joint Publications Research Service, Arlington, Va.
SOVIET ECONOMIST DISCUSSES EFFICIENT USE OF SCIENTIFIC POTENTIAL **c81**
G. Lakhtin *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 47-50 Transl. into ENGLISH from Pravda (Moscow), 4 Jul. 1983 p 7 (For primary document see N84-10348 01-31)
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Scientific technical development is described as a process in which the revolutionizing transformations of production and its gradual perfection are combined. Each such innovation often represents a jump, the refutation of an old technical principle and accession to the throne of a new one. Then a more or less lengthy period sets in during which the new principle is disseminated, perfected and, finally, becomes obsolete. Thus the radio tube was replaced by the transistor, which in turn gave way to the integrated microcircuit. But the radio tube was improved for a long whole before it faded into the class of old technology. It became miniature and with a fast warm-up. Author

N84-10356# Joint Publications Research Service, Arlington, Va.
SCIENTISTS DISCUSS INCREASED PRODUCTION WITH FEWER WORKERS
A. L. Merson *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 51-55 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 26 May 1983 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

After the group from the sector of methodology planning and organization of applied research of the Social Economic Problems Institute of the USSR Academy of Sciences had completed this research. A. L. Merson, senior scientific associate of the institute and candidate of economic sciences, met with V. A. Semenov. The initiative of scientists of the Scientific Production Association of the Central Scientific Research and Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov on fulfilling five-year plan tasks with fewer workers is described. Today, however, the idea of how this important initiative works and what hinders its creative introduction in other collectives is considered. This research was conducted in a number of Leningrad's scientific organizations. Author

N84-10357# Joint Publications Research Service, Arlington, Va.
SCIENTIST DISCUSSES PROBLEMS IN INTRODUCING NEW TECHNOLOGY
G. Popov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 56-60 Transl. into ENGLISH from Sov. Rossiya (Moscow), 27 May 1983 p 2 (For primary document see N84-10348 01-31)
Avail: NTIS HC A06

The problems of introducing new technologies to science are discussed. It is found that everything depends on production, which is a poor introduction to innovations. Production, however, is the main thing. Listening to the plants and sectorial organs is recommended while the problem of new technology introduction could be changed. The introductory stage appears to be weakest link since it is the introduction or a proving ground where the imperfections of the entire mechanism wich control scientific and technical progress is graphically demonstrated. E.A.K.

N84-10358# Joint Publications Research Service, Arlington, Va.
ACCELERATION OF S&T PROGRESS DISCUSSED **c81**
M. Zaripov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 61-65 Transl. into ENGLISH from Sov. Rossiya (Moscow), 18 May 1983 p 2 (For primary document see N84-10348 01-31)
Avail: NTIS HC A06

The Order of Lenin Nizhnekamskneftekhim Production Association is a young enterprise which started production about 15 years ago. During these years, the enterprise has become equal with industrial giants and has become a test area for carrying out bold engineering solutions. The ways production was increased and the possible causes of success are discussed. E.A.K.

N84-10359# Joint Publications Research Service, Arlington, Va.
ACADEMICIAN OUTLINES ACCOMPLISHMENTS, NEW DEVELOPMENTS IN OPTICAL PHYSICS **c74**
In its USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 66-75 Transl. into ENGLISH from Kommun. Belorussii (Minsk), no. 4, Apr. 1983 p 65-72 (For primary document see N84-10348 01-31)
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Programs in physical optics, particularly the application of lasers in scientific research and product development is discussed topics discussed include: the use of spectroscopy in chemical processes; the use of dye lasers; irradiation in wheat seeds; training of scientists in mathematics physics, and other technologies; laser application on industrial plants; laser chemistry; laser application in medicine. E.A.K.

N84-10360# Joint Publications Research Service, Arlington, Va.
IMPROVED PLANNING FOR LOCAL TERRITORIAL UNITS URGED **c81**

L. Barminskiy *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 76-83 Transl. into ENGLISH from Kommun. Belorussii (Minsk), no. 4, Apr. 1983 p 73-79 (For primary document see N84-10348 01-31)
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The combination of sectorial and territorial planning, which ensures the comprehensive and effective solution of economic and social problems at all levels of the national economy was discussed. It is assorted that the total governments should embody the principle of unity between the territorial and sectorial administration; they are responsible for both the development of production and for improving the quality of social, everyday, and cultural services to the public. E.A.K.

N84-10361# Joint Publications Research Service, Arlington, Va.
EFFECT FROM INTRODUCTION OF NEW TECHNOLOGY IN THE GEORGIAN SSR
Irakliy Zhordaniya *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 84-87 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), 6 Mar. 1982 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

The improvement of planning and control and the introduction of scientific and technical achievements into the national economy was discussed. A close connection of control of scientific and technological progress with the general economic administration and inclusion in plans of new technology and real khozraschet activity of the ministries, industrial associations and enterprises was assumed. This has had a positive effect on increasing the rates of economic development of the republic and an improvement of its ranch structure. E.A.K.

N84-10362# Joint Publications Research Service, Arlington, Va.
SCIENTIFIC-PRODUCTION COMPLEXES ORGANIZED IN GEORGIA c81
Zakhariy Papava *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 88-91 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), 30 Mar. 1982 p 2 (For primary document see N84-10348 01-31)
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Acceleration of scientific and technological progress and transition of the economy to an intensive path of development, together with stable forward development of the national economy were proposed. More efficient use of the production potential of the country, every posible saving of all types of resources and improvement of the quality of work are considered to be the main conditions for the solution of the main task of the 11th Five-Year Plan. E.A.K.

N84-10363# Joint Publications Research Service, Arlington, Va.
CONTRIBUTIONS OF ACADEMIC INSTITUTES TO EFFECTIVENESS OF NEW TECHNOLOGY IN THE GEORGIAN SSR c81
Ilya Rubinshtein *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 92-96 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), 10 Mar. 1983 p 2 (For primary document see N84-10348 01-31)
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Increasing the economic effectiveness of scientific developments was discussed. In the last Five-Year Plan alone the economic effect from the introduction of the results of scientific research of institutions of the Georgian Academy of Sciences amounted to over 140 million rubbles, which is twice the indicators of the 9th Five-Year Plan. Considerable favorable economic effects are obtained from the introduction of technology development during the first 2 years of the 11th Five Year Plan. E.A.K.

N84-10364# Joint Publications Research Service, Arlington, Va.
WORK OF ESTONIAN ASTROPHYSICS AND ATMOSPHERIC PHYSICS INSTITUTE DESCRIBED c88
Juhan Toomsoo *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 97-100 refs Transl. into ENGLISH from Noorte Haal (Tallinn), 12 Apr. 1983 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

Research at the Toravere Observatory is reported. The research in experimental physics, theoretical astrophysics, galactic physics, atmospheric physics, cosmic research, and cosmic radiometrics is described. A field of science, a scholarly cadre and machinery were developed at Toravere. The participation in projects on all continents, which include Antarctica, on several cosmodromes, are reported. E.A.K.

N84-10365# Joint Publications Research Service, Arlington, Va.
UZBEK SCIENTIFIC INTELLIGENTSIA UNDER DEVELOPED SOCIALISM c81
N. Mutalov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 101-108 refs Transl. into ENGLISH from Obshchestvennyye Nauki v Uzbekistane (Tashkent), no. 2, Feb. 1983 p 14-19 (For primary document see N84-10348 01-31)
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The importance of which science has become an organic part of social life is outlined. This is an objective process which is conditioned by the course of development of society. The problems of creating a material technical base for communism, improving social relations and forming and the new man cannot be solved without participation of all contingents of the Soviet intelligentsia which includes the scientific population. Questions relating to the further improvement of selection and training of scientific and scientific pedagogic cadres are treated. It is asserted that scientific personnel constitutes one of the fastest growing social groups of the Soviet intelligentsia. E.A.K.

N84-10366*# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
SURFACE ACOUSTIC WAVE/SILICON MONOLITHIC SENSOR/PROCESSOR Final Report
Stephen T. Kowel, Philipp G. Kornreich, Akbar Nouhi, Robert Kilmer, Mohammed Ayub Fathimulla, and Ebrahim Mehter Sep. 1983 123 p refs
(Contract NsG-1611)
(NASA-CR-174541; NAS 1.26:174541; TR-83-18) Avail: NTIS HC A06/MF A01 CSCL 13H

A new technique for sputter deposition of piezoelectric zinc oxide (ZnO) is described. An argon-ion milling system was converted to sputter zinc oxide films in an oxygen atmosphere using a pure zinc oxide target. Piezoelectric films were grown on silicon dioxide and silicon dioxide overlayed with gold. The sputtered films were evaluated using surface acoustic wave measurements, X-ray diffraction, scanning electron microscopy, Auger electron spectroscopy, and resistivity measurements. The effect of the sputtering conditions on the film quality and the result of post-deposition annealing are discussed. The application of these films to the generation of surface acoustic waves is also discussed.
Author

N84-10367# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
GENERA USE OF CBN IN TOOL GRINDING: TECHNOLOGY AND ECONOMICS
H. R. Meyer and H. J. Wiemann 1982 26 p refs Transl. into ENGLISH from Techn. Mitteilungen (West Germany), v. 71, no. 5, May 1978 p 242-249
(CSIR-Trans-1688) Avail: NTIS HC A03/MF A01

A long term test program in which all the grinding processes technically capable of being converted from conventional abrasives to crystalline boron nitrides (CBN) was carried out in close cooperaton with an abrasives manufacturer and a tool manufacturer whose production included all types of cutters; notably, hobs, profile cutters, side melting cutters, and face milling cutters, as well as crushing rolls for profiling grinding wheels. The material mainly used was EM05C05 confirming to S 6-5-2-5. N.W.

N84-10368# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
GRINDING OF CAST IRON WITH WHEELS MADE OF SUPER-HARD MATERIALS

N. Ja. Korz 1982 14 p refs Transl. into ENGLISH of Sverhtverdye Mater. (USSR), no. 2, LT/QB, Oct. 1982
(CSIR-Trans-1687) Avail: NTIS HC A02/MF A01

Optimum grinding conditions for cast iron with wheels made of superhard materials were determined. Type PP 250 x 10 wheels made of metallized and non metallized diamond and various brands of CBN with 125/100 grains at 100 % concentration on metellic M0 16 and organic B1 type bonds were used. Type KZ 25 CMIK 5 wheels of the same size were investigated for purposes of comparison. The experimental samples, 80 and 230 mm in diameter made from grey cast iron (HB 178), alloy cast iron (HB 200), high strength cast iron (HB 207), chilled cast iron (HB 460) and hardened cast iron (HCR 52-55), were ground on a 3 B 12 cylindrical grinder at cutting speeds of 35 m/sec, a workpiece velocity of 54 m/min and a longitudinal feed of 0,5 - 2,0 m/min. The crossfeed ranges rom 0,005 to 0,4 mm/sec. The cutting fluid was an aqueous solution of calcium carbonate supplied at 3 to 5 l/min. S.L.

N84-10369# British Gas Corp., London (England).
THE MECHANICS OF BRIDGING CRACKS
E. Bagda and G. Lipp [1982] 14 p refs Transl. into ENGLISH from Farbe and Lack (West Germany), v. 88, no. 12, 1982 p 1000-1003
(BLL-T6144/LRST652/83(9022.048)) Avail: British Library Lending Div., Boston Spa, Engl.

Since the width of cracks and the crack movements are of the same order of magnitude crack bridging coatings are subject to extremely severe viscoelastic demands. It is important for practical applications to interpret the mechanics of the bridging of cracks correctly so that reliable predictions about the likely success of coating systems can be made on the basis of measured data. Proof is by means of photoelastic models that the bridging of cracks is associated with viscoelastic flow in the coating beyond the crack flanks and that the mechanics of the bridging of cracks has to be explained by a three dimensional mode of consideration rather than only two dimensionally. S.L.

N84-10370*# National Aeronautics and Space Administration, Washington, D. C.
METHOD OF MANUFACTURING CERAMIC SHAPED ARTICLES
Kiyoshi Inoue May 1983 16 p Transl. into ENGLISH of Japanese Patent no. 54-105110 (3 Feb. 1978) p 47-51 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77242; NAS 1.15:77242) Avail: NTIS HC A02/MF A01 CSCL 13H

A method of manufacturing ceramic shaped articles, wherein tapes of ceramic powder material in mixture with a binder material and special additives are shaped and then articles are stamped out from said tapes and sintered in a sintering furnace is described. Author

N84-10371# SRI International Corp., Menlo Park, Calif.
EVALUATION OF WES ONE-DIMENSIONAL DYNAMIC SOIL TESTING PROCEDURES Final Report
Lynn Seaman Vicksburg, Miss. Army Engineers Waterways Experiment Station Jun. 1983 36 p refs
(Contract DACA39-82-M-0095; DA Proj. 4A1-61102-AT-22)
(AD-A130925; WES/MP/SL-83-19) Avail: NTIS HC A03/MF A01 CSCL 08/13

The Geomechanics Division of the Waterways Experiment Station (WES) tests soils to provide material property data for ground motion calculations in support of high explosives experiments. Thus, the validity of the ground motion predictions depends greatly on the WES material properties used. The usual WES experiments are uniaxial strain (UX) and triaxial shear (TX) tests that can be performed at static testing rates and at dynamic rates with rise times down to about one millisecond. However, in the field experiments being simulated, the measured rise times are often 0.01 ms up to 0.1 ms. Recently, an effort has been made to obtain test data in UX and TX devices with rise times of about 0.1 ms. Some of the test data obtained at these very high rates have appeared to be anomalous, suggesting that wave propagation or other effects may be invalidating the data. Because of these questions about the high rate soils test data, WES asked SRI to evaluate the testing methods used at WES and the data reduction device. This report documents an evaluation of laboratory test data obtained from the explosive-loaded uniaxial strain device developed at WES and the data analysis procedures currently being used. GRA

N84-10372# Army Construction Engineering Research Lab., Champaign, Ill.
PRELIMINARY ANALYSIS OF THE SEISMIC VULNERABILITY OF SELECTED BUILDINGS AT FORT ORD, CALIFORNIA USING THE RAPID EISMIC ANALYSIS PROCEDURE Final Report
Mar. 1983 81 p
(Contract MIPR-CIAO-81-58; DA Proj. 4A7-62731-AT-41)
(AD-A130924; CERL-TR-M-327) Avail: NTIS HC A05/MF A01 CSCL 13/13

A preliminary evaluation of the seismic vulnerability of a selected group of 17 essential and high-potential-loss buildings at Fort Ord, CA, was conducted using the Navy's Rapid Seismic Analysis (RSA) procedure. This procedure estimates the potential earthquake ground-shaking effects on buildings, including estimated damage and the cost of these damages. In addition a list of recommended modifications to enhance the accuracy and capabilities of the RSA procedure was also developed. Where appropriate, these modifications were incorporated into the analysis of the selected group of buildings. Based on the results of the preliminary evaluation, about one third of the buildings in the initial group would have estimated damage greater than 60 percent of their estimated replacement cost under the maximum site ground acceleration o 0.40 g. This indicates that the buildings analyzed have a high probability of being severely damaged or of collapsing under the maximum site ground acceleration. It was recommended that these buildings be analyzed in detail to determine the degree of strengthening and cost required to reduce the seismic hazards to these buildings and their occupants. Author (GRA)

N84-10373# California Univ., Livermore. Lawrence Livermore Lab.
CONTRAST BETWEEN NATURAL AND EXPERIMENTALLY CONTROLLED FIRES IN FORCED VENTILATED ENCLOSURES
N. Alvares and K. Foote 6 May 1983 41 p Presented at the Comm. on Safety of Nucl. Installations Meeting, Los Alamos, N. Mex., 26-28 Apr. 1983
(Contract W-7405-eng-48)
(DE83-013038; UCRL-88588; CONF-830442-2) Avail: NTIS HC A03/MF A01

Controlled fire experiments in forced ventilated enclosures to provide accurate data with which to compare results from enclosure fire models were undertaken. Methods for fire control include: limiting fuel geometry; defining fire duration; metering fuel flow rate and controlling ventilation rate. Concern that highly controlled fires may provide unrealistic conditions in enclosures prompted us to conduct several naturally burning fires as a test of comparative fire output performance criteria. It is shown that the determining control parameter for either natural or controlled fires is the ventilation rate: fully ventilated conditions both natural and controlled fires produced very similar conditions. DOE

N84-10374# Chillcast, Inc., Marion, Ohio.
PROCESS DEVELOPMENT OF MAKING BEARINGS AND BUSHINGS FROM CONTINUOUS-CAST SAE 660 BRONZE ALLOY PLATE Final Report
James L. Chill [1983] 11 p
(Contract DE-FG01-80IR-10321)
(DE83-014234; DOE/IR-10321/T1) Avail: NTIS HC A02/MF A01

A process for making bearings and bushings offers considerable potential. The ability to minimize machining and scrap loss, especially for middle and large diameter bearings, should help to lower manufacturing costs appreciably. In addition, the substantial improvement of mechanical properties resulting from rolling offers

the increased performance over as-cast SAE 660 bronze bearings in terms of better load carrying ability and wear resistance. DOE

N84-10375# Ketron, Inc., Wayne, Pa.
EVALUATING AND QUANTIFYING USER PERCEPTION OF PAVEMENT SERVICEABILITY Final Report, Apr. 1981 - Feb. 1983
Michael S. Janoff and James B. Nick Feb. 1983 189 p refs Sponsored in part by Pennsylvania Dept. of Transportation
(PB83-207308; FHWA/PA-83/007; Rept-2313) Avail: NTIS HC A09/MF A01 CSCL 13B

The validity of using physical measures of road roughness obtained by a Mays Road Meter as a surrogate of human responses was determined in order to predict the user perception of ride quality or serviceability of various highway surfaces. Three types of psychometric scaling methods for obtaining subjective ride quality ratings were evaluated in a pilot study. Since it was found that there was essentially no difference among the results provided by either method, the scale originally used in the AASHO road test was selected for uses in the main study. GRA

N84-10376# National Bureau of Standards, Washington, D.C. Center for Building Technology.
TURBULENT WIND EFFECTS ON TENSION LEG PLATFORM SURGE Final Report
Emil Simiu and Stefan D. Leigh Mar. 1983 49 p refs Sponsored in part by Minerals Management Service
(PB83-207464; NBS-BSS-151; LC-83-600507) Avail: NTIS HC A03/MF A01 CSCL 13B

A procedure is presented for estimating surge response to turbulent wind in the presence of current and waves. The procedure accounts for the nonlinearity of the hydrodynamic forces with respect to surge and for the coupling of aerodynamic and hydrodynamic effects. It is shown that current wind spectra do not model correctly the wind speed fluctuations at very low frequencies and an alternative model of the wind spectrum, consistent with fundamental principles, is presented. The equation of surge motion under turbulent wind in the presence of current and waves is solved for typical tension leg platforms, and it is shown that under extreme wave conditions the damping provided by the hydrodynamic forces precludes the occurence of significant wind-induced resonant amplification effects even if the drag coefficient in the Morison equation is very small. Author (GRA)

N84-10377# Little (Arthur D.), Inc., Cambridge, Mass.
SUPERCRITICAL FLUID REGENERATION OF ADSORBENTS Final Report, Jun. 1979 - Dec. 1981
R. P. deFilippi and R. J. Robey May 1983 95 p refs Sponsored by EPA
(PB83-207597; EPA-600/2-83-036) Avail: NTIS HC A05/MF A01 CSCL 13B

The results of a program to perform studies supercritical (fluid) carbon dioxide (SCF CO2) regeneration of adsorbents, using samples of industrial wastewaters from manufacturing pesticides and synthetic solution, and to estimate the economics of the specific wastewater treatment regenerations, based on test data are given. Processing costs for regenerating granular activated carbon GAC) for treating industrial wastewaters depend on stream properties and regeneration throughput. GRA

N84-10378# Minnesota Univ., Minneapolis. Dept. of Civil and Mining Engineering.
OPTIMIZING COAGULATION-ADSORPTION FOR HALOFORM AND TOC (TOTAL ORGANIC CARBON) REDUCTION Final Report, Apr. 1979 - Apr. 1982
M. J. Semmens, G. Hohenstein, A. Staples, G. Norgaard, K. Ayers, and M. P. Tyson May 1983 244 p refs
(Contract EPA-R-806377)
(PB83-210757; EPA-600/2-83-042) Avail: NTIS HC A11/MF A01 CSCL 13B

The removal of organic matter from Mississippi River water by coagulation and softening processes and the influence of operating parameters upon the removal process are examined. Furthermore, since activated carbon is typically employed to reduce organic concentrations, the effectiveness of various pretreatments are evaluated for their impact upon carbon bed life and the product water quality. GRA

N84-10379# North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
BOND CHARACTERISTICS OF EPOXY COATED REINFORCED BARS Final Report
David W. Johnson and Paul Zia Aug. 1982 178 p refs Sponsored in part by North Carolina Dept. of Transportation and Highway Safety
(PB83-205518; ERSD-110-79-4; FHWA/NC-82/002) Avail: NTIS HC A09/MF A01 CSCL 13C

The flexural bond characteristics of epoxy coated reinforcing bars were evaluated in comparison to uncoated bars under static and fatigue loadings. Comparative tests were conducted between reinforcing bars with epoxy coated, normal mill scale and blast cleaned surface conditions. Both 6 and 11 bars were included. Forty flexural bond specimens of the beam and type were tested in static and fatigue loadings. Three embedment lengths were used in the tests. In addition, six slab specimens were tested to evaluate the effect of epoxy coating on concrete crack spacing and crack width. Behavior is assessed in terms of influence on crack spacing, crack width, bond strength and bond fatigue. Suggestions for design criteria modification are proposed. GRA

N84-10380# Washington Univ., Seattle. Dept. of Civil Engineering.
SULFUR EXTENDED ASPHALT PAVEMENT EVALUATION IN THE STATE OF WASHINGTON: SR 270 HIGHWAY PAVEMENT PERFORMANCE REPORT Final Report
J. P. Mahoney, R. L. Terrel, and J. C. Cook Nov. 1982 50 p refs Sponsored in part by Washington State Dept. of Transportation
(Contract DOT-FH-11-9620)
(PB83-205567; FHWA/WA-RD-56.3) Avail: NTIS HC A03/MF A01 CSCL 13C

The placement and performance of sulfur extended asphalt (SEA) paving mixtures at a highway test site (SR 270) near Pullman, Washington is summarized. The mixture and structural designs and construction details are included. This is followed by a discussion of the data collection and analysis accomplished over a three year evaluation period (1979-1982). A major experimental feature of the study was the use of 0.100 (conventional asphalt concrete), 30/70 and 40/60 SEA binder ratios (sulfur/asphalt ratios are expressed as weight percents in the experimental paving mixtures. GRA

N84-10381# Washington Univ., Seattle. Dept. of Civil Engineering.
SULFUR EXTENDED ASPHALT PAVEMENT EVALUATION: EXECUTIVE SUMMARY Final Report
Joe P. Mahoney Sep. 1982 19 p refs Sponsored in part by FHWA
(PB83-205971; FHWA/WA/RD-53.3) Avail: NTIS HC A02/MF A01 CSCL 13C

This summary report overviews two previously issued study reports. One report assesses The availability and pricing of sulfur with respect to sulfur extended asphalt (SEA) paving mixture is assessed. A laboratory oriented testing program which was principally used to examine the durability and aging characteristics of SEA paving mixtures is reported. GRA

N84-10382# Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
INTERFACE BONDING OF SHOTCRETE REINFORCED BRICK MASONRY ASSEMBLAGES, VOLUME 1 Technical Report, 1981 - 1982
Douglas W. Robinson and Lawrence F. Kahn Sep. 1982 147 p refs
(Grant NSF CEE-80-02583)
(PB83-223206; SCEGIT-82-107-Vol-1; NF/CEE-82132-Vol-1) Avail:

NTIS HC A07/MF A01 CSCL 13M

Nine 9 sq ft shotcrete reinforced brick masonry assemblages and one 9 sq ft brick masonry control specimen were tested under a single reversed cycle diagonal compression load similar to the ASTM E519-74 testing procedures. The interface surface conditions, between the brick and shotcrete were varied. The surfaces of the single sythe of old brick were either dry, wet, or epoxy coated before application of the 3-inch reinforced shotcrete layer. Ultimate load capacities of the specimens were similar, however, specimens with epoxy-enhanced interfaces were the most ductile; the dry brick specimens showed interface bond failure immediately after the ultimate inplane load was attained. GRa

N84-10383# Georgia Inst. of Tech., Atlanta. School of Civil Engineering.

INTERFACE BONDING OF SHOTCRETE REINFORCED BRICK MASONRY ASSEMBLAGES. VOLUME 2: APPENDICES Technical Report, 1981 - 1982

Douglas W. Robinson and Lawrence F. Kahn Sep. 1982 188 p refs

(Grant NSF CEE-80-02583)

(PB83-223214; SCEGIT-83-107-Vol-2-App; NSF/CEE-82133-Vol-2-App) Avail: NTIS HC A09/MF A01 CSCL 13M

The first of four appendices contains interviews with local masonry experts. It is reported that when stucco is applied to masonry walls, an increased resistance to lateral and implane forces results. The dangers of a solfate attack on brick masonry are examined, and it is pointed out that exposure to sulfate attack for 50 to 100 years can destroy the physical strength of a cement product. Distinctions are drawn between large core, small core, and double row core brick, and it is noted that the predominate brick used is the large core. The other appendices contain design, construction, and material properties for 46 specimens, a generalized finite element analysis, and plots for four specimens. GRA

N84-10384# Thermo Electron Corp., Waltham, Mass.

OPEN-CYCLE VAPOR COMPRESSION HEAT PUMP Annual Technical Report, Jan. - Dec. 1982

F. E. Becker and A. E. Ruggles Apr. 1983 71 p

(PB83-228429; TE4224-71-83; GRI-82/0069) Avail: NTIS HC A04/MF A01 CSCL 13A

Large quantities of low-grade energy are wasted by industry in the form of low-pressure steam and low-temperature heat. The practical and economical recovery of energy from these sources is restricted by the limited number of useful applications for low-grade energy, and is further complicated by contamination of the waste streams. Thermo electron has developed an open-cycle steam heat pump system capable of the direct recovery and upgrading of low-grade waste steam. The system compresses low-pressure waste steam (or steam made from sources of low-temperature waste heat) to produce high-pressure steam suitable for use in industrial processes. (GRA)

N84-10385# Portland Cement Association, Skokie, Ill. Construction Technology Labs.

PRESTRESSED PAVEMENT ACCELERATED TESTING PROGRAM Final Report

Peter J. Nussbaum Jun. 1983 43 p refs

(Contract DOT-FH-11-8894)

(PB83-225763; FHWA/RD-82/115) Avail: NTIS HC A03/MF A01 CSCL 13B

This report presents a test program to evaluate performance of prestressed concrete pavements. Effects of climataic exposure, prestressing, and traffic loading features unique to prestressed pavements are considered. Instrumentation types and installation locations are discussed along with measurements to be obtained. (GRA)

N84-10386# Portland Cement Association, Skokie, Ill.

EVALUATION OF INNOVATIVE CONCEPTS RELATING TO PRESTRESSED CONCRETE PAVEMENTS, VOLUME 5 Interim Report

Adrain T. Ciolko and Peter J. Nussbaum Jun. 1983 50 p

(Contract DOT-FH-11-8894)

(PB83-222349; FHWA/RD-82/114-Vol-5) Avail: NTIS HC A03/MF A01 CSCL 13C

This report presents an evaluation of three methods for post-tensioning concrete pavements without embedded steel tendons. All methods permit joint movement while maintaining slab pre-stress at the pavement joint. One method consists of thin-wall hydraulically presurized bellows as stressing elements. The second uses a pnuematically charged rubber bladder. The third method makes use of stacked Belleville springs. (GRA)

N84-10387# Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering

SHORT-TERM MECHANICAL PROPERTIES OF HIGH-STRENGTH LIGHT-WEIGHT CONCRETE

S. M. Morales Aug. 1982 108 p refs

(Grant NSF CEE-78-05124)

Avail: NTIS HC A06/MF A01 CSCL 13C

An experimental investigation was undertaken to establish the mechanical properties of high-strength light-weight concrete. Concretes having compressive strengths ranging from 2,564 to 8,585 psi, and densities between 90 and 103 pcf were tested. The results include a comprehensive study of the engineering properties of light-weight concrete. Data are presented on compressive strength gain with age, speciment size effect, static modulus of elasticity, Poisson's ratio, modulus of rupture, splitting tensile strength, and drying effects. Results are compared to data on normal-weight concrete. The deformation characteristics of light-weight concrete are studied in detail. Author (GRA)

N84-10388# Cornell Univ., Ithaca, N.Y. Dept. of Structural Enginnering.

SPIRALLY-REINFORCED HIGH-STRENGTH CONCRETE COLUMNS

S. M. Morales Aug. 1982 273 p refs

(Grant NSF CEE-78-05124)

(PB83-223297; NSF/CEE-82141) Avail: NTIS HC A12/MF A01 CSCL 13C

An experimental investigation was undertaken to establish the response of high strength concrete confined in steel spirals when subjected to short term monotonic concentric loading. The main variables studied were the compressive strength and density of the concrete, amount of confinement and specimen size. The program included a total of 94 short columns, most of which were cast without a concrete cover over the spiral steel. A reduced number of specimens was designed to model geometrically a full sized spirally reinforced column to study the nature of the failure of their protective cover. Author (GRA)

N84-10389# Kajima Inst. of Construction Technology, Tokyo (Japan).

STUDY ON STRENGTH, ELASTIC MODULUS OF ARTIFICAL LIGHTWEIGHT AGGREGATE CONCRETE

Masayoshi Kakizaki Apr. 1982 23 p refs

(PB83-224824; KICT-39) Avail: NTIS HC A02/MF A01 CSCL 13C

Aggregate strength of artificial lightweight concrete and concrete used with this artifial lightweight aggregate can be expected to have nearly the same strength as normal weight concrete. An experimental study of properties of concrete strength and correlation between compressive and tensile and flexural strengths and elastic modulus of its concrete was made.

Author (GRA)

N84-10390# Kajima Inst. of Construction Technology, Tokyo (Japan).

STUDY ON SMALL SCALE MODEL TESTS FOR REINFORCED CONCRETE STRUCTURES- SMALL SCALE MODEL TESTS BY USING 3mm DIAMETER DEFORMED RE-BARS

Yasuo Murayama and Susumu Noda Feb. 1983 30 p refs

(PB83-224832; KICT-40) Avail: NTIS HC A03/MF A01 CSCL 13M

Scaled reinforcing materials of 3 mm in diameter (D3) having the same configuration and equal mechanical properties with commercial deformed re-bars were prepared fo use in small scale model tests for reinforced concrete structures. Three types of bond tests-pull out, eccentricity pull out and both bar ends tension-were performed to ensure the bond properties of the scaled reinforcing materials. In parallel, the bond tests for the commercial deformed re-bars of D25, D13 and D6 and the commercial steel materials of 3mm in diameter such as 03 round steel wires, 03 indented steel wires and M3 threaded steel rods were also performed in order to compare their properties. Author (GRA)

N84-10391# Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering.
TIME-DEPENDENT BEHAVIOR OF HIGH-STRENGTH CONCRETE SUSTAINED COMPRESSIVE STRESSES
Mohammad Mahmoud Smadi Nov. 1982 283 p refs
(Grant NSF CEE-79-26392)
(PB83-227041; Rept-82-16; NSF/CEE-82142) Avail: NTIS HC A13/MF A01 CSCL 13C

Results are reported of an investigation of the behavior of high-strength concrete under sustained stresses in excess of normal working stress levels. The infuences of drying and of sustained stresses, ranging from 40 percent up to stress levels above which failure occurs under sustained load, on the shrinking and creep properties of three materials are examined. The long-term shrinkage is shown to be greater for low-strength concrete than for medium and high-strength concrete. Creep strain, creep coefficient, and specific creep are found to be smaller for high-strength concrete than for normal strength concrete. The influences of high sustained stresses on deformation characteristics are explored and the initiation, propagation, and stability and stability of internal microcracking under short-term and long-term stresses above and below the long-term strengths are investigated. GRA

N84-10392# Operations Research, Inc., Silver Spring, Md.
ANALYSIS AND SUMMARY OF OTEC (OCEAN THERMAL ENERGY CONVERSION) COLD WATER PIPE COSTS
1983 21 p refs
(Contract MO-A01-78-00-4137)
(PB83-221002; DOE/NOAA/OTEC-42; NOAA-83062003) Avail: NTIS HC A02/MF A01 CSCL 13I

Six CWP preliminary designs were included in the analysis. These included two Fiberglass Reinforced Plastic Designs (Nos. 1,4), an Elastomer Design (No.2), a Polyethylene Design (No. 3), a Stiffened Steel Shell (No. 5), and a Bottom Mounted Steel Design No. 6), Designs Nos. 1-3 were performed by TRW. Designs Nos. 4-6 were performed by Science Applications Inc. (SAI). Each contractor developed cost estimates according to DOE's Work Breakdown structure (WBS) and reported them in their reports. These estimates were reviewed and further analyzed by TSC. GRA

N84-10393# Hawaiian Dredging and Construction Co., Honolulu.
OCEAN THERMAL ENERGY CONVERSION COLD WATER PIPE AT-SEA TEST PROGRAM
Jul. 1982 385 p refs
(Grant NA81SA-C-00728)
(PB83-221119; DOE/NOAA/OTEC-41; NOAA-83062001; DR-1) Avail: NTIS HC A17/MF A01 CSCL 13J

A detailed design for a 10 foot diameter, 1,000 foot long fiberglass reinforced plastic (FRP) cold water pipe (CWP) was tested a sea aboard a platform. The wall of the pipe was of sandwich construction with FRP facesheets and a core of syntactic foam. In addition to developing the design for the pipe itself, other activities were conducted to support the design effect. GRA

N84-10394# Noda (Edward K.) and Associates, Honolulu, Hawaii.
OTEC (OCEAN THERMAL ENERGY CONVERSION) COLD WATER PIPE AT-SEA TEST PROGRAM. VOLUME 2.F.: ENVIRONMENTAL DESIGN CRITERIA
Jul. 1982 383 p refs
(PB83-221127; DOE/NOAA/OTEC-41; NOAA-83062002; DR-2) Avail: NTIS HC A17/MF A01 CSCL 13J

The prototype for one third scale model is envisioned to be the OTEC Pilot Plant design in the 10/40 MWe size range with an estimated CWP diameter of about 30 feet and an overall vertical length of about 3,000 feet. Thus the one third scale CWP consists of pipe about 10 feet in diameter and 1,000 feet long. A side selection evaluation was initiated to establish a site which would meet both the logistic requirement for construction and operation, provide adequate wave wind climate required for the test validation and finally exhibit bottom slope and sediment layer characteristics adequate for the mooring system, as confirmed by geophysical surveys. GRA

N84-10395# Noda (Edward K.) and Associates, Honolulu, Hawaii.
ENVIRONMENTAL DESIGN CRITERIA FOR THE 1/3 SCALE OTEC COLD WATER PIPE AT-SEA TEST SITE OFF HONOLULU, HAWAII
Jan. 1983 56 p refs
(PB83-221143; DOE/NOAA/OTEC-66; NOAA-83062004) Avail: NTIS HC A04/MF A01 CSCL 13J

In order to expedite development of the design of the 1/3 scale At-Sea Test CWP/Platform/Mooring System, environmental design criteria data at the proposed At-Sea Test site evaluated from available historic data is provided. An evaluation of the available data to date is described. It is expected that as the design develops actual site specific observation will be obtained to verify these critical design criteria. GRA

N84-10396# Naval Civil Engineering Lab., Port Hueneme, Calif.
THE OTEC (OCEAN THERMAL ENERGY CONVERSION) MOORING TECHNOLOGY
D. R. Shields, R. L. Wendt, and B. A. Johnson Dec. 1982 152 p refs Sponsored in part by Department of Energy and National Oceanic and Atmospheric Administration
(PB83-221168; TM-44-83-05; DOE/NOAA/OTEC-74; NOAA-83062036) Avail: NTIS HC A07/MF A01 CSCL 13J

Existing technology for mooring components which may be suitable for OTEC use is summarized. Due to the platform size, depth of water, and length of design life required for an operational OTEC plant, only large and high capacity mooring components were investigated. Engineering, test, and manufacturer's data on wire rope, synthetic rope (nylon, polyester and Kevlar), anchors, deck fittings and machinery, and design concepts for tension leg platform mooring systems are included. A significant portion of the effort was directed to the assessment of synthetic rope technology and its application to moorings. GRA

N84-10397# Busby (R. Frank) Associates, Arlington, Va.
POTENTIAL INSPECTION, MAINTENANCE AND REPAIR TECHNIQUES FOR THE OTEC (OCEAN THERMAL ENERGY CONVERSION) SYSTEMS
Feb. 1983 165 p refs
(PB83-221374; DOE/NOAA/OTEC-40; NOAA-83062005) Avail: NTIS HC A08/MF A01 CSCL 13J

One of the major post-installation considerations of the OTEC platforms is the performance of underwater inspection, maintenance and repair (IMR) during their 30-year design life. In order to assist in the conceptual development of an IMR program, this study was undertaken using the two OTEC candidate configurations as a baseline. The objectives of the study were: conduct an inventory of underwater Non-Destructive Examination (NDE) devices including a description of their performance capabilities, dimensional data, the areas of the various structures where they are most applicable, and a narrative description of the level of performance capabilities, dimensional data, the areas of the various structures where they are most appliable and a narrative description of the level of performance they have attained to date, and to conduct an inventory of NDE device deployment vehicles. GRA

N84-10398# Taylor Woodrow Construction Ltd., Southall (England).
STUDY OF THE PRACTICALITIES OF CONCRETE FOR OTEC

(OCEAN THERMAL ENERGY CONVERSION) AND OTHER MARINE APPLICATIONS
1981 128 p refs
(PB83-221887; TWC/014N/2285/81; DOE/NOAA/OTEC-68; NOAA-83062028) Avail: NTIS HC A07/MF A01 CSCL 13J

A contractor was asked to prepare a design information report on the general aspects of the use of concrete in offshore structures, with particular application to OTEC. In this report, concrete as a material for marine construction was reviewed and the practicalities of constructing large marine structures as well as outlining our proposals for a lightweight concrete cold water pipe. The great majority of the work presented in this document is the result of research into and development of offshore structures and experience of planning and executing marine constructions. As such, the study is based firmly on reality rather than conjecture. GRA

N84-10399# Kajima Inst. of Construction Technology, Tokyo (Japan).
SEISMIC BEHAVIOR OF STEEL BENT-BRACING SYSTEM
Kozo Toyama Mar. 1983 53 p refs
(PB83-224840; KICT-41) Avail: NTIS HC A04/MF A01 CSCL 13M

Bracing is an effective aseismic element of a steel frame, and it is known that the dynamic response behavior of a braced frame can become extremely complicated under the lateral load due to the deterioration of restoring force which follows the buckling of compressive bracing. In this paper, in order to improve the aseismic characteristics of such braced frames, a special bracing called 'bend bracing' having stable restoring force characteristics is applied to the braced frame, and the effect is studied both experimentally and analytically. Bent-bracing has the initial deflection provided at the center of bracing by previously bending the section. GRA

N84-10400# National Center for Devices and Radiological Health, Rockville, Md. Office of Medical Devices.
STERILE DEVICES: A GMP (GOOD MANUFACTURING PRACTICES) WORKSHOP MANUAL
Richard DeRision, Andrew Lower, and Richard Bimonte May 1983 595 p refs
(PB83-226563; HHS/PUB/FDA-83-4168; FDA/NCDRH-82/43) Avail: NTIS HC A25/MF A01 CSCL 13H

The manual, which covers GMPs for sterilization processes, presents model procedures and forms as well as a variety of articles and reprints. It is a compilation of GMP materials that small device firms may find useful in understanding how some manufacturers have successfully compiled with the GMP requirements as they apply to the manufacture of sterile devices. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-10401*# City Coll. of the City Univ. of New York. Communications Systems Lab.
COMPUTER SIMULATOR FOR A MOBILE TELEPHONE SYSTEM Final Report, 21 Apr. 1982 - 19 Apr. 1983
Donald L. Schilling and Chaim Ziegler 1983 96 p
(Contract NAG3-277)
(NASA-CR-174533; NAS 1.26:174533) Avail: NTIS HC A05/MF A01 CSCL 17B

A software simulator to help NASA in the design of the LMSS was developed. The simulator will be used to study the characteristics of implementation requirements of the LMSS's configuration with specifications as outlined by NASA. Author

N84-10402*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
MOBILE RADIO ALTERNATIVE SYSTEMS STUDY TRAFFIC MODEL
William T. Tucker and Roy E. Anderson Jun. 1983 60 p refs
(Contract NAS3-23244)
(NASA-CR-168062; NAS 1.26:168062; GE-CRD-83-SRD-037) Avail: NTIS HC A04/MF A01 CSCL 17B

The markets for mobile radio services in non-urban areas of the United States are examined for the years 1985-2000. Three market categories are identified. New Services are defined as those for which there are different expressed ideas but which are not now met by any application of available technology. The complete fulfillment of the needs requires nationwide radio access to vehicles without knowledge of vehicle location, wideband data transmission from remote sites, one- and two way exchange of short data and control messages between vehicles and dispatch or control centers, and automatic vehicle location (surveillance). The commercial and public services market of interest to the study is drawn from existing users of mobile radio in non-urban areas who are dissatisfied with the geographical range or coverage of their systems. The mobile radio telephone market comprises potential users who require access to the public switched telephone network in areas that are not likely to be served by the traditional growth patterns of terrestrial mobile telephone services. Conservative, likely, and optimistic estimates of the markets are presented in terms of numbers of vehicles that will be served and the radio traffic they will generate. Author

N84-10403*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
MOBILE RADIO ALTERNATIVE SYSTEMS STUDY TERRESTRIAL SYSTEMS CONCEPTS
Norman Cromwell, Howard L. Lester, and Roy E. Anderson Jun. 1983 76 p refs
(Contract NAS3-23244)
(NASA-CR-168063; NAS 1.26:168063; GEC-CRD-83-SRD-038) Avail: NTIS HC A05/MF A01 CSCL 17B

Terrestrial systems for satisfying the markets for mobile radio services in non-urban areas of the United States in the years from 185 to 2000 were investigated. Present day mobile communication technologies, systems and equipment are described for background in evaluating the concepts generated. Average propagation ranges are calculated for terrestrial installations in each of seven physiographic areas of the contiguous states to determine the number of installations that would be required for nationwide coverage. Four system concepts are defined and analyzed to determine how well terrestrial systems can fulfill the requirements at acceptable costs. Nationwide dispatch, telephone and data services would require terrestrial installations in many locations where they would be used infrequently and would not recover their investment. Access to a roaming vehicle requires that the vehicle location be known within the range limit of the terrestrial installation in which the vehicle is present at the time of the call. Access to that installation must be made through the public switched telephone network usually involving a long-distance toll charge, and requiring costly means to track or locate the vehicle as it moved through the network of installations. A.R.H.

N84-10404*# General Electric Co., Schenectady, N. Y. Corporate Research Development.
MOBILE RADIO ALTERNATIVE SYSTEMS STUDY SATELLITE/TERRESTRIAL (HYBRID) SYSTEMS CONCEPTS
John D. Kiesling (General Electric Co., Philadelphia) and Roy E. Anderson Jun. 1983 273 p refs
(Contract NAS3-23244)
(NASA-CR-168064; NAS 1.26:168064; GEC-CRD-83-SRD-039) Avail: NTIS HC A12/MF A01 CSCL 17B

The use of satellites for mobile radio service in non-urban areas of the United States in the years from 1985 to 2000 was investigated. Several satellite concepts are considered: a system with single-beam coverage of the fifty United States and Puerto Rico, and multi-beam satellites with greater capacity. All of the needed functions and services identified in the market study are provided by the satellite systems, including nationwide radio access

to vehicles without knowledge of vehicle location wideband data transmission from remote sites, two way exchange of short data and control messages between vehicles and dispatch or control centers, and automatic vehicle location (surveillance). The costs of providing the services are within acceptable limits, and the desired returns to the system investors are attractive. The criteria by which the Federal Communication judges the competing demands for public radio spectrum are reviewed with comments on how the criteria might apply to the consideration of land mobile satellites. Institutional arrangements for operating a mobile satellite system are based on the present institutional arrangements in which the services are offered to the end users through wireline and radio common carriers, with direct access by large private and government users. Author

N84-10405*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A COMPARISON OF THE DOMESTIC SATELLITE COMMUNICATIONS FORECAST TO THE YEAR 2000

William A. Poley, Jack F. Lekan, Jack A. Salzman, and Steven M. Stevenson Oct. 1983 33 p refs

(NASA-TM-83516; E-1859; NAS 1.15:83516) Avail: NTIS HC A03/MF A01 CSCL 17B

The methodologies and results of three NASA-sponsored market demand assessment studies are presented and compared. Forecasts of future satellite addressable traffic (both trunking and customer premises services) were developed for the three main service categories of voice, data and video and subcategories thereof for the benchmark years of 1980, 1990 and 2000. The contractor results are presented on a service by service basis in two formats: equivalent 36 MHz transponders and basic transmission units (voice: half-voice circuits, data: megabits per second and video: video channels). It is shown that while considerable differences exist at the service category level, the overall forecasts by the two contractors are quite similar. ITT estimates the total potential satellite market to be 3594 transponders in the year 2000 with data service comprising 54 percent of this total. The WU outlook for the same time period is 2779 transponders with voice services accounting for 66 percent of the total. Author

N84-10406# Coast Guard, Washington, D.C. Office of Research and Development.

RADAR RESONANCE REFLECTION FROM SETS OF PLANE DIELECTRIC LAYERS Final Report

P. D. Jackinsl and G. C. Gaunaurd May 1983 35 p refs

(AD-A128680; USCG-D-14-83) Avail: NTIS HC A03/MF A01 CSCL 17/9

The prediction of the Resonance Scattering Theory (RST) for the reflection coefficient from a set of two contiguous plane dielectric layers separating two semi-infinite dissimilar non-conducting media, is constructed and compared to the exact classical model solution. The comparsion serves to: (1) show the accuracy and simplicity of the RST prediction, and (2) to underline the usefulness of the RST to produce simple physical interpretations of generally complex phenomena. The analysis provides a systematic method for detecting the presence of a dielectric layer under another one covering it (possibly the situation caused by an oil spill in ice-covered Artic regions), by certain modulation effects present in the 'response surface' of the returned echoes. This method also identifies the material composition of the lower or hidden layer in the bilaminar configuration. The process disentangles which resonance feature present in the radar reflection coefficient is caused by which of the two interacting layers. RST, therfore, solves the inverse scattering problem for the composition and thickness not only of the top visible (ice) layer, but also of the substance (oil) hidden under that upper layer. GRA

N84-10407# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.

ELECTROMAGNETIC COUPLING TO AN INFINITE WIRE THROUGH A SMALL APERTURE OF ARBITRARY SHAPE

Sandy W. Hsi and Roger F. Harrington Feb. 1983 65 p refs

(Contract N00014-76-C-0225)

(AD-A130425; SYRU/DECE/TR-83-3; TR-19) Avail: NTIS HC A04/MF A01 CSCL 20/14

Electromagnetic coupling through an arbitrarily-shaped small aperture in an infinite conducting plane to an infinitely-long wire is investigated. The moment method is used to solve the integral equations numerically for the electric current on the wire and the equivalent magnetic current of the aperture. The general form of an equivalent circuit of the transmission line for the problem of a wire passing by an arbitrarily sized and shaped aperture is developed. Results for a small circular aperture are presented. Author (GRA)

N84-10408# CyberCom Corp., Arlington, Va.

UHF RADIOWAVE PROPAGATION THROUGH FORESTS Report, Sep. 1981 - Sep. 1982

R. H. Lang, A. Schneider, S. Seker, and F. Altman Fort Monmouth, N. J. Army Communications-Electronics Command Sep. 1982 182 p refs

(Contract DAAK80-81-C-0136; DA Proj. 1L1-61102-AH-48)

(AD-A130399; CECOM-81-0136-4; CTR-108-01) Avail: NTIS HC A09/MF A01 CSCL 20/14

A model for UHF radiowave propagation through a forest of tree trunks, branches, and leaves is developed using the discrete scattering theory of Foldy and Lax. The forest is represented as a time-invariant ensemble of tree trunks, branches, and leaves all having prescribed location and orientation statistics. Tree trunks are modelled as infinitely-long, circular, lossy-dielectric cylinders; branches as finitely-long, circular, lossy-dielectric cylinders; and leaves as flat, circular, lossy-dielectric discs. Mathematical expressions are found for the effective dyadic susceptibilities of the equivalent continuous medium and for the specific attenuation associated with the (coherent) fields. Using biophysical parameters typical of a deciduous, hardwood forest, these expressions are found to be in reasonable agreement with experimental results. An anisotropic half-space model of the forest is reflected-, and lateral wave components of the mean field presented for a pulse of a few nanoseconds duration and a frequency of 600 Magahertz. A preliminary analysis shows the importance of the random (incoherent) field at a distance of one kilometer and at frequencies above 100 Megahertz. Author (GRA)

N84-10409# Princeton Univ., N. J. Information Sciences and Systems Lab.

THE DETECTION OF SIGNALS IN IMPULSIVE NOISE Report, Sep. 1981 - Feb. 1982

E. J. Modugno, III, J. B. Thomas, and S. C. Schwartz Jun. 1983 188 p refs

(Contract N00014-81-K-0146)

(AD-A130393; TR-13) Avail: NTIS HC A09/MF A01 CSCL 09/4

This dissertation addresses the problem of detecting known, discrete-time signals in additive non-Gaussian noise. The case of statistically independent samples is emphasized. After a brief introduction to the detection problem, the characteristics and sources of impulsive noise are discussed. Several models for impulsive noise are then presented. The complexity of these models and the need for simple density functions to approximate the first order characteristics of impulsive noise justify consideration of three systems of densities. These three systems are: a generalized Gaussian noise, the Johnson S(u) System, and a mixture model. These are used throughout this dissertation to provide examples. In many detection problems it may only be possible to define a class of probability densities which contains the actual noise density. In such cases minimax detectors may be used to guarantee a lower bound on detector performance for the entire class. The minimax detector is the optimum detector for the worst case density. It is shown that the worst case density, in terms of minimizing the asymptotic probability of detecting a signal, is that density which minimizes Fisher's Information over the entire class. Several classes of densities are considered and conditions are established for the minimax detectors. GRA

N84-10410# HRB-Singer, Inc., State College, Pa.
AUDIO SIGNAL MANAGEMENT TECHNIQUES Final Technical Report, Oct. 1981 - Dec. 1982
A. Penny Anderson, James K. Lane, and Burl K. Pudliner Griffiss AFB, N.Y. RADC Feb. 1983 14 p
(Contract F30602-81-C-0300; AF Proj. 7055)
(AD-A130391; RADC-TR-83-41) Avail: NTIS HC A02/MF A01 CSCL 20/1

The objective of the Audio Signal Management technical program was to design and develop an Exploratory Development Model Audio Signal Management System (ASMS). This system is to be used to test and evaluate present and future voice data entry algorithms, processing techniques, and hardware modules. The ASMS consists of internal functions implemented on the RADC PDP 11/70 computer, external functions implemented in stand-alone hardware devices, an Audio Distribution Network (ADN) for shaping and routing audio signals, and an ADP Data entry communication interface/keyboard translator with HP 2645A terminal for function control and transcription. GRA

N84-10411# Queens Coll., Flushing, N. Y. Dept. of Computer Sciences.
COMPUTERIZED AUDIO PROCESSOR Final Technical Report, Jul. 1980 - Aug. 1982
Mark R. Weiss and Ernest Aschkenasy Griffiss AFB, N.Y. RADC May 1983 39 p
(Contract F30602-80-C-0197; AF Proj. 1174)
(AD-A130390; RADC-TR-83-109) Avail: NTIS HC A03/MF A01 CSCL 20/1

The Computerized Audio Processor (CAP) is a computer synthesized electronic filter that removes interference from received or recorded speech signals. The CAP automatically detects and attenuates impulse sounds and tones (e.g., ignition noise, switching transients, whistles, chirps, hum, buzzes, FSK telegraphy, etc). It also attenuates wideband random noise. All operations of the CAP are fully automatic. Input signals are processed in real time, with a maximum lag of 340 msec. The CAP implements three proven signal processing techniques. One of these (IMP) virtually eliminates most loud impulse noises. A second technique (DSS) automatically detects tones and attenuates them by up to 46 dB. The third technique (INTEL) provides up to 18 dB attenuation of wideband random noise. GRA

N84-10412# Michigan State Univ., East Lansing. Div. of Engineering Research.
RADAR WAVEFORM SYNTHESIS FOR TARGET IDENTIFICATION Final Report, 11 May 1982 - 10 May 1983
Kun-Mu Chen 5 Jun. 1983 30 p refs
(Contract N00019-82-C-0208)
(AD-A130363) Avail: NTIS HC A03/MF A01 CSCL 17/9

A new scheme for radar target detection and discrimination, the radar waveform synthesis method, is investigated. This method consists of synthesizing aspect-independent excitation signals with particular waveforms which can be used to convolve with the radar return of the target to produce single-natural modes or the zero-mode of the target in the late-time period. When the synthesized excitation signals for a preselected target are convolved with the radar return from a wrong target, the convolved outputs will be significantly different from the expected natural modes or zero-mode, thus, the wrong target can be discriminated. The synthesized signals for single-mode excitation and the synthesized signal for zero-mode excitation (K-pulse) have been used to convolve with measured radar returns of targets. The results of convolution indicate the applicability of this new scheme in practice. Author (GRA)

N84-10413# Yale Univ., New Haven, Conn. Center for Systems Science.
ANALYSIS OF THE HOWELLS-APPLEBAUM ALGORITHM IN THE PRESENCE OF MOVING INTERFERENCE. THE USE OF LATTICE FILTERS IN DAPTIVE ARRAY PROCESSORS. STABILITY ANALYSIS OF LMS ADAPTIVE FILTERS. ADAPTIVE ARRAY PROCESSORS WITH MOVING INTERFERENCE Final Report
Franz B. Tuteur 22 Oct. 1982 15 p refs
(Grant AF-AFOSR-0007-80; AF Proj. 2304)
(AD-A130218; AFOSR-83-0561TR; Rept-8213) Avail: NTIS HC A02/MF A01

Four ongoing projects are briefly described. These are: (1) Analysis of the Howells-Applebaum algorithm in the presence of moving interference; (2) The use of lattice filters in adaptive array processors; (3) Stability analysis of LMS adaptive filters; and (4) Adaptive array processors with moving interference treated from the frequency-domain point of view. Conclusions are: the Howells-Applebaum algorithm is so insensitive to interference motion that it is unnecessary to consider such motion in the design; and adaptive array processors based on the frequency-domain approach have a worst performance than those based on time-domain approaches mainly because of the time lag required in the operation of the Fourier transform operation. Author (GRA)

N84-10414# Naval Research Lab., Washington, D. C. Communication Sysytems Engineering Branch.
GENERALIZED LIST DETECTION FOR CODED MFSK/FH SIGNALING ON ADING AND JAMMING CHANNELS Final Report
Paul J. Crepeau 27 Jun. 1983 31 p refs
(RR01411001)
(AD-A130199; NRL-8708) Avail: NTIS HC A03/MF A01 CSCL 20/14

A robust scheme, called list-metric detection, is presented for coded MSFK/FH signaling. In this technique, demodulator outputs are ranked in magnitude and decoder metrics are assigned according to their position in the ranking. The cutoff rate parameter Ro which characterizes the coding channel is derived for fixed metric assignments and optimum adaptive metrics. Results are given for the optimum metric case for both the Rayleight fading channel and a worst-case tone jamming channel. These results show that list-metric detection provides performance superior to hard-decision for all cases considered. Author (GRA)

N84-10415# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
WORKSHOP ON RESEARCH TECHNIQUES IN WAVE PROPAGATION AND SCATTERING Final Report
Vasundara V. Varadan and Vijay K. Varadan 12 May 1983 5 p Workshop held in Columbus, Ohio, 18-21 Oct. 1982
(Contracts DAAG29-82-M-0174; N00014-82-G-0092)
(AD-A130270) Avail: NTIS HC A02/MF A01 CSCL 20/14

A Workshop/Symposium on Research Techniques in Wave Propagation and Scattering was held at the Ohio State University October 18-21, 1982. This workshop was co-sponsored with the generous financial support of the U.S. Army Research Office, U.S. Office of Naval Research, the Center for Welding Research, O.S.U., and the Department of Engineering Mechanics, O.S.U. The workshop format consisted of a core of a general lectures of fifty minutes duration each and several shorter contributions that were of twenty minutes duration each. In addition, there were three panel discussions. The general lectures were of an expository nature on fundamental concepts and basic analytical/numerical techniques for the solution of wave scattering and propagation problems. The speakers were noted for their contribution to these techniques and in many cases have pioneered the techniques that they elaborated upon. These lectures were invaluable to the participants since they were of a pedagogical nature and easily understood by even those not very familiar with the particular method. The written version of many of these lectures will appear in a four volume Handbook on Acoustic, Electromagnetic and Elastic Wave Scattering to be published by North Holland as a separate project. GRA

N84-10416# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A COMPACT Q-K/BAND DUAL FREQUENCY FEED HORN
Joseph C. Lee 3 May 1983 37 p refs
(Contract F19628-80-C-0002)
(AD-A130258; ESD-TR-83-012; TR-645) Avail: NTIS

HC A03/MF A01 CSCL 09/1

A mm-wave dual-frequency circularly polarized feed for an offset reflector antenna is being developed for a portable satellite ground terminal. The two frequency bands are Q- and K-bands for transmit and receive, respectively. Requirements for the antenna feed design are: low cost, compact size, rugged construction, high efficiency, and low sidelobes in both of the frequency bands. The chosen feed design consists of a single corrugated horn designed for the two separate frequency bands with two circular waveguide concentric openings at the horn throat. The inner circular waveguide is used for transmit, and the outer coaxial circular waveguide is used for receive. In these waveguides, separate circular polarizers, orthomode transducers, and impedance matching elements for each frequency band are designed and integrated in a compact and solid fashion. Electrically, good impedance match and small axial ratio are obtained for both frequency bands. Radiation patterns with approximately equal illumination taper at the reflector edge and coincident phase centers are obtained in both frequency bands. Detailed design considerations and measured performance data are presented. Author (GRA)

N84-10417# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.

SIMULATION OF SYSTOLIC NETWORKS WITH A SYNTAX DIRECTED SOLVER FOR SYSTEMS OF SEQUENCE EQUATIONS

Rami G. Melhem Oct. 1983 43 p refs

(Contract N00014-80-C-0455)

(AD-A130232; ICMA-83-58) Avail: NTIS HC A03/MF A01 CSCL 09/2

The main objective of this paper is to supplement a model that was previously suggested for the verification of systolic networks. A simple language is presented to express the system of sequence equations that models the operation of the network. Then a syntax directed interpreter is developed to solve this system for specific forms of the inputs and to produce the corresponding outputs. This technique for the verification of a certain computation on a systolic network is equivalent with the simulation of its execution. Author (GRA)

N84-10418# Rome Air Development Center, Griffiss AFB, N.Y. Propagation Branch.

TWO-LAYER MODEL OF LINE-OF-SIGHT REFRACTIVE MULTIPATH PROPAGATION

Koichi MAno Jan. 1983 60 p refs

(AF Proj. 4600)

(AD-A130474; RADC-TR-82-337) Avail: NTIS HC A04/MF A01 CSCL 20/14

The two-layer model of the line-of-sight refractive multipath propagation was examined by employing the earth-flattening system of coordinates and the result was compared with an unpublished result carried out by other workers who studied the problem in the ray-straightening system. That these results should be identical is self-evident in principle provided the analysis is carried out rigorously. However, different approximations are used in the two methods, so it must still be demonstrated that the two methods given the same result in practice as well as in theory. The atmosphere is assumed to consist of two layers. The lower layer, which is immediately above the Earth's surface, is a non-ducting one, typically the standard atmosphere, with a constant thickness, and the upper one is a ducting layer of sufficient thickness. On the condition that the height above the Earth's surface and the elevation angle of the ray remain sufficiently small throughout the ray trajectory, it can be shown that the ray path in either layer may be approximated as a circular arc of appropriate radius. A comparison of our quartic equation from the Earth Flattening Method with the similar equation obtained from the Ray-Straightening Method shows that the two equations are essentially identical. Moreover, the results for the transit time between the terminals and the intensity of the received signals are also shown to be essentially the same. GRA

N84-10419# Informatics General Corp., Bellevue, Neb.

COMMUNICATIONS SUPPORT PROCESSOR (CSP) Final Technical Report, 1 Nov. 1980 - 31 Oct. 1982

M. Gene Konopik and Robert B. Mack Griffiss AFB, N.Y. RADC Feb. 1983 86 p

(Contract F30602-81-C-0004; AF Proj. 2183)

(AD-A130360; RADC-TR-83-40) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report discusses the advanced capabilities developed for the Communications Support Processor and the impact these capabilities have on the system and its users. The technical performance of the CSP, and the CSP system support functions and the on-site maintenance support are detailed in this report. The improvements to the CSP system include improved transportability site-unique gateways, on-line retrieval of traffic, plain language addressing and the fully automated routing of messages. Author (GRA)

N84-10420# Naval Research Lab., Washington, D. C. Radar Analysis Branch.

SURVEY OF RADAR AUTOMATIC DETECTION AND TRACKING (ADT) Final Report

G. V. Trunk 30 Jun. 1983 19 p refs

(RR0210543)

(AD-A130358; NRL-8698) Avail: NTIS HC A02/MF A01 CSCL 17/9

This report surveys the state of the art of automatic detection and tracking for radars. This subject is reviewed under the three subtopics of (1) noncoherent integration techniques, (2) false alarm control, and (3) tracking system. In the area of noncoherent detection, various integrators such as the moving window, feedback integrator, two-pole filter, binary integrator, and batch processor are discussed. False alarms are controlled by using either adaptive thresholding, nonparametric detectors, or clutter maps. A general outline of a track-while-scan systems is given and then a discussion of the tracking filter, maneuver-following logic, track initiation, and correlation logic is presented. Finally, methods of integrating data from both colocated and multisite radars are discussed. Author (GRA)

N84-10421# Kansas Univ. Center for Research, Inc., Lawrence. Lab. for Remote Sensing.

INTERACTION OF THE RADAR WAVES WITH THE CAPILLARY WAVES ON THE OCEAN Interim Technical Report

S. Barkeshli and R. K. Moore May 1983 196 p refs

(Contract N00014-79-C-0533)

(AD-A129690; CRINC/RSL-TR-419-1) Avail: NTIS HC A09/MF A01 CSCL 17/9

Measurements of the radar cross-section of the sea were made from the Noordwijk platform off the Dutch coast during September-November 1979 as part of Project MARSEN using an FM microwave spectrometer over the 8-18 GHz frequency range. A set of techniques for studying the modulation of the capillary waves on the ocean surface was developed for use in analyzing the entire observation set and is presented here as applied to a single set of observations. Thus, the results given here are only of limited oceanographic significance, but illustrate the types of analysis to be performed when these techniques are applied to more data. Measured scattering coefficient based on instantaneous radar footprint was cross-correlated with wave height and slope for measurements at the Noordwijk tower on 21 September 1979. GRA

N84-10422# North Carolina State Univ., Raleigh. Dept. of Marine Earth and Atmospheric Sciences.

DEVELOPMENT OF A SWEEP-FREQUENCY ELECTROMAGNETIC EXPLORATION METHOD FOR THREE-DIMENSIONAL TERRAIN ANALYSIS Final Report, 15 Mar 1979 - 14 Mar. 1983

I. J. Won May 1983 31 p refs

(Contract DAAG29-79-C-0057)

(AD-A129607; ARO-16265.2-GS) Avail: NTIS HC A03/MF A01 CSCL 08/7

During the period of the present research contract: (1) We have completed the design and construction of a prototype sweep-frequency electromagnetic exploration system; (2) We have tested extensively a prototype swept-frequency electromagnetic system on various geological environments and demonstrated the system capability to delineate subsurface geological structures of the Earth; (3) We have initiated several theoretical approaches suitable for the interpretation of the spectral profiles generated by the swept-frequency system which are to be correlated with geological structures. Author (GRA)

N84-10423# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
LANGUAGE PROCESSING FOR SPEECH UNDERSTANDING
William A. Woods Jul. 1983 53 p refs
(Contract N00014-77-C-0371)
(AD-A131281; BBN-5376) Avail: NTIS HC A04/MF A01 CSCL 05/7

This report considers language understanding techniques and control strategies that can be applied to provide higher-level support to aid in the understanding of spoken utterances. The discussion is illustrated with concepts and examples from the BBN speech understanding system, HWIM (Hear What I Mean). The HWIM system was conceived as an assistant to a travel budget manager, a system that would store information about planned and taken trips, travel budgets and their planning. The system was able to respond to commands and answer questions spoken into a microphone, and was able to synthesize spoken responses as output. HWIM was a prototype system used to drive speech understanding research. It used a phonetic-based approach, with no speaker training, a large vocabulary, and a relatively unconstraining English grammar. Discussed here is the control structure of the HWIM and the parsing algorithm used to parse sentences from the middle-out, using an ATN grammar. GRA

N84-10424# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MULTIMODE RADAR SIGNAL PROCESSOR INTEGRATION FACILITY Interim Report, 3 Feb. 1981 - 15 Dec. 1982
John N. Horn, Gregory A. Frascadore, and Byron R. Stephens May 1983 99 p refs
(AF Proj. 7622)
(AD-A130655; AFWAL-TR-83-1045) Avail: NTIS HC A05/MF A01 CSCL 17/9

This effort is centered on the Multimode Radar Signal Processor (MRSP), which is a high speed prototype signal processor based on the Westinghouse PSP-X design. The basic objective is to gain familiarity and programming proficiency with this relatively complex system, and ultimately apply its high speed capabilities to practical radar signal processing problems. Brief descriptions of the MRSP hardware and software configurations are included for reader continuity. The major portion of the report describes specific activities related to MRSP operations. Primary among these was the development of a software package to integrate a video output display system to the MRSP. Additionally, several representative programs were written to demonstrate the high speed signal processing capabilities of the MRSP as a complete system. Finally, several significant improvements were incorporated into the original MRSP support software package provided by the contractor. Author (GRA)

N84-10425# Naval Research Lab., Washington, D. C.
A MATCHED FILTER DOPPLER PROCESSOR FOR AIRBORNE RADAR Interim Report
G. A. Andrews and S. L. Sheller 13 Jul. 1983 29 p refs
(XF12141000; WF12100000)
(AD-A130653; NRL-8700) Avail: NTIS HC A03/MF A01 CSCL 17/9

The airborne radar presents noteworthy problems of clutter cancellation because of platform motion. The returns from fixed objects must be filtered out as clutter. A matched filter signal processor design is presented that produces the necessary level of clutter rejection. The results are compared to various processor configurations, e.g., moving target indicators (MTIs) cascaded with a matched filter processor, displaced phase center antenna (DPCA) cascaded with a matched filter processor, the fast Fourier transform (FFT), and MTIs cascaded with the FFT. The processors are compared on the basis of their clutter rejection, signal processing losses, and minimum detectable velocity (MDV) capabilities. Author (GRA)

N84-10426# Naval Research Lab., Washington, D. C.
MICROCOMPUTER AIDED TRACKING (MCAT) Final Report
A. B. Mays, D. C. Cross, and J. L. Walters 12 Jul. 1983 13 p refs
(S0166AA)
(AD-A130651; NRL-8709) Avail: NTIS HC A02/MF A01 CSCL 09/2

The goal of the MCAT project was to investigate the effectiveness of operator initiated tracks followed by automatic tracking. Adding this capability to a display was intended to relieve operator overload and fatigue which results when the operator is limited to grease pencil tracking. MCAT combines several microprocessors and a microcomputer-driven PPI(Plan Position Indications) with graphics capability. The operator is required to make the initial detection and MCAT then performs automatic detection and tracking in a limited area centered around the detection. This approach was chosen because it is far less costly than a full-up auto detect and track approach. MCAT is intended for use in a non-NTDS (Naval Tactical Data System) environment where operator aids are minimal at best. There are approximately 200 non-NTDS ships in today's Navy. Each of these ships has a combat information center (CIC) which includes numerous PPIs typically SPA-25s, SPA-66s, SPA-50s) and various manual means (e.g., air summary plotboards, NC-2 plotters) of producing summary plots and performing calculations (e.g., maneuvering board paper) pertinent to tracks in progress. The operator's duties are time-consuming and there are many things that could be done via computer control and graphics displays that the non-NTDS operate must now do manually. Because there is much manual information handling, accumulation of data is slow and there is a large probability of error. GRA

N84-10427# Martin Acoustics Software Technology, San Diego, Calif.
TRANSMISSION LINES WITH VERY LOSSY CONDUCTORS AND SEAWATER RETURN Final Contractor Report, Oct. 1981 - Sep. 1982
G. E. Martin San Diego, Calif. Naval Ocean Systems Center 18 Oct. 1982 88 p refs
(Contract N66001-82-M-1575; WF11100000)
(AD-A130739; NOC-CR-167) Avail: NTIS HC A05/MF A01 CSCL 09/1

There are potential benefits in undersea cable technology by the use of copper-coated non-conductors (Kevlar) or poor conductors (graphite) with conventional or sea-water outer conductor. Kevlar is a very strong non-conductive fiber even in small sizes and it can be fabricated as a bundle of many copper-coated strands. Non-metallic conductors are being developed for a wide range of uses. For example, graphite materials are being used to provide strong flexible golf clubs and spark plug wires that cause minimal interference with radio reception. There is extensive research and development in these materials such as development of light-weight strong materials for airplanes. The particular application of interest in the research reported here is the cables used as undersea data links for transmitting signals from hydrophones under water to sonobuoy radio transmitters at the surface of the ocean. Non-metallic conducting materials have recently shown impressive capabilities and prospective future gains from the viewpoint of such ocean applications including high strength, low specific gravity and relatively low resistance. This report is intended to provide the technical development of such data transmission lines in order to provide the basis for design of such cables. The technical basis for the design of undersea cables is provided in considerable detail. The electromagnetic theory, algorithm development, and properties of materials are described. Optimal designs are considered. GRA

N84-10428# North Texas State Univ., Denton. Dept. of Physics.
COHERENT PROPAGATION AND SUM FREQUENCY GENERATION INTO THE VACUUM ULTRAVIOLET Final Report, 1 Nov. 1981 - 31 Oct. 1982
Jean-Claude Diels 31 Oct. 1982 15 p refs
(Grant AF-AFOSR-0044-82; AF Proj. 2301)
(AD-A130729; AFOSR-83-0595TR) Avail: NTIS HC A02/MF A01 CSCL 20/14

An experimental and theoretical study of resonant coherent four wave mixing has been initiated. Prior theoretical investigation by the author has demonstrated that coherent propagation effects can be used to keep all the energy in the radiation field, even in the presence of resonant absorption. An energy conversion efficiency of 6% was predicted for third harmonic conversion in lithium to 190 nm. In the period covered. (1) Constructed a dye laser amplifier, and achieved an output of 1 mJ for wavelengths covering the most important resonances of lithium (571 nm, 672 nm, 639 nm); (2) Purchased and assembled the hardware of a data acquisition system to accurately characterize each pulse (amplitude, duration, phase modulation) and perform the measurement of two photon absorption and third harmonic as a function of the relative phase and delay in the pulse sequence; (3) Investigated the feasibility of increasing the conversion efficiency through the use of natural or induced autoionizing resonances; and (4) Made a theoretical study of the influence of coherence on three photon ionization in lithium. GRA

N84-10429# California Univ., Irvine. Dept. of Physics.
THE INTERACTION OF ELECTROMAGNETIC RADIATION WITH SOLID MATERIALS Final Report, 1 Jan. 1978 - 31 Dec. 1982
Alexei A. Maradudin and D. L. Mills Jun. 1983 10 p refs
(Contract F49620-78-C-0019; AF Proj. 2306)
(AD-A130727; AFOSR-83-0618TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

Results are reported which were obtained during a theoretical program on the interaction of electromagnetic waves with solids. The report places special emphasis on the 1982 calendar year, which is the final year of the program. We have explored, during the tenure of the program a variety of interactions which influence the (linear) response of solids to external electromagnetic radiation, with emphasis on the frequency regime which extends from the visible, through the infrared and down to the microwave. Examples are the study of intrinsic free carrier scattering mechanisms in doped, polar materials, where our theory provides an excellent account of data with no adjustable parameters. Also, the scattering of electrons from phonons and other electrons in the near proximity of the surface, and their influence on the microwave response of metals has been explored. The last few years of the program saw increasing emphasis on the propagation of waves along interfaces with nonplanar profile (rough surfaces, periodic grating structures), and on the nonlinear interaction between waves in the near vicinity of planar, and nonplanar interfaces. In this body of work, perturbation theoretic methods were developed, which treat the deviations from a perfectly flat profile as small, and also we had considerable success with nonperturbative methods applied to periodic structures possibly of large amplitude. GRA

N84-10430# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz.
STANDARD ENGINEERING INSTALLATION PACKAGE. GROUND CONTROL APPROACH RADAR SYSTEMS AND RADOME(S) Final Report
17 Jan. 1983 160 p refs
(AD-A130726; USACEEIA-SEIP-011) Avail: NTIS HC A08/MF A01 CSCL 17/9

This standard engineering installation package (SEIP) is one in a series for upgrading air traffic control and navigational and landing aids at Army airfields and heliports worldwide. It provides the guidance involved in selecting, acquiring, and installing ground control approach radar systems. It gives a system description along with the technical aspects of the equipment and installation areas. It contains a list of applicable documents, describes a comprehensive checklist for site surveys, tells how to install equipment, the manpower required to do it and gives a bill of materials to accomplish it all. The SEIP describes quality assurance inspections and gives sample forms to ascertain areas of responsibility, checklists, and certification. One section gives a detailed test plan and checkout procedure while the system is in operation and suggests the form for a technical acceptance certificate. The SEIP also contains sample coordination documents of all agencies involved in the upgrading process and a completion certification that the project was met all of the test criteria. Author (GRA)

N84-10431# Maryland Univ., College Park. Dept. of Physics and Astronomy.
COHERENT SCATTERING OF LIGHT INTO HIGH FREQUENCY RADIOWAVES Annual Report, 1 Feb. 1982 - 31 Jan. 1983
J. Weber 31 Mar. 1983 39 p refs
(Grant AF-AFOSR-0164-82; AF Proj. 2301)
(Ad-A130691; AFOSR-83-0615TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The coherent radiation interaction, and scattering, by nuclei of a crystal for which each volume element has the same sign of the interaction with an incident beam, and for which the coupling of scatters with each other is important, is computed. Experiments are described which appear to verify the theory. Author (GRA)

N84-10432# Berkeley Research Association, Calif.
RESULTS OF PLACES DATA ANALYSIS
C. W. Prettie 1 Sep. 1982 88 p refs
(Contract DNA001-81-C-0130; DNA Proj. I25-AAXY)
(AD-A130933; AD-E301171; PD-BRA-82-278R; DNA-TR-81-170)
Avail: NTIS HC A05/MF A01 CSCL 20/9

The results of analyses performed to support PLACES data reduction and data interpretation are presented. Beacon receiver measurements of the scattering of a 100 MHz pseudo-noise beacon signal BPSK modulated at a 10 MHz rate were made during an occulatation by the structured IRIS ion cloud. The scattering produced features in the received St. George Island signal that are shown to be in good quantitative agreement with propagation effect predictions produced from an optically derived model of the ion cloud extent. The features in the received data are also in qualitative agreement with the optical features in a coincident St. George Island photograph. Neutral wind shear rate is determined in the optical analyses to be directed with a 351 deg azimuth with a 1.5 meter per second per kilometer of altitude magnitude. Aircraft propagation measurements of the JAN ion cloud reveal a steady decay of the TEC until the cloud effects vanish at roughly 200 minutes after release. The following mechanism is proposed to explain late time barium cloud decay: Barium ions are removed from the ion cloud as current carriers and are replaced by molecular air ions which quickly recombine. The mechanism is found to be highly efficient. The kHz frequency spurs in the NRL density probe data from JAN are briefly investigated. The spur frequency is found to have no clear-cut dependence on local density, is not confined to the ion cloud region, and at times two spurs are visible in the data. GRA

N84-10433# ITT Defense Communications Div., Nutley, N.J.
LIMITED CONNECTED SPEECH EXPERIMENT Final Technical Report, 28 May - 20 Aug. 1981
Patrick B. Landell Griffiss AFB, N.Y. RADC Mar. 1983 90 p
(Contract F30602-81-C-0155; AF Proj. 4594)
(AD-A131048; RADC-TR-82-316) Avail: NTIS HC A05/MF A01 CSCL 17/2

The purpose of this contract was to demonstrate that connected Speech Recognition (CSR) can be performed in real-time on a vocabulary of one hundred words and to test the performance of the CSR system for twenty-five male and twenty-five female speakers. This report describes the contractor's real-time laboratory CSR system, the data base and training software developed in accordance with the contract, and the results of the performance tests. GRA

N84-10434# ALPHATECH, Inc., Burlington, Mass.
DISTRIBUTED DETECTION OF SIGNAL WAVEFORMS IN ADDITIVE GAUSSIAN OBSERVATION NOISE
G. S. Lauer (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) and N. R. Sandell, Jr. 1983 61 p refs
(Contract F49620-81-C-0015; AF Proj. 2304)
(AD-A131016; TP-160; AFOSR-83-0588TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper is concerned with the detection of signal waveforms by a distributed surveillance network comprised of: a collection of spatially separated sensors, and local signal processors collocated with the sensors. The local signal processors are assumed to implement likelihood ratio tests to detect the presence or absence of the signals. Signal detections may be used for local decision-making or passed upward to a fusion center for further processing. In either case, the local detection thresholds cannot be determined independently, but must be determined jointly to optimize overall surveillance system performance. Results are presented concerning the nature of this threshold computation for a number of interesting cases. Author (GRA)

N84-10435# Rome Air Development Center, Griffiss AFB, N.Y. Reliability and Compatibility Div.
MICROWAVE INTERACTION WITH THIN MULTIPLE CONDUCTIVE COATINGS Final Technical Report, Nov. 1981 - Nov. 1982
Victor M. Martin Mar. 1983 244 p refs
(AF Proj. 2338)
(AD-A131091; RADC-TR-83-62) Avail: NTIS HC A11/MF A01 CSCL 11/3

This report presents the analytic solution for the surface temperatures of the first layer of a system of N layers being exposed to microwave radiation. This provides for a correlation between surface temperatures is to be measured via infrared thermography. Author (GRA)

N84-10436# Royal Australian Navy Research Lab., Edgecliff.
A COMPUTER PROGRAM FOR THE PREDICTION OF SEARCH RADAR PERFORMANCE
M. R. Battaglia Mar. 1983 43 p refs
(AD-A131080; RANRL-TN(EXT)-1/83) Avail: NTIS HC A03/MF A01 CSCL 17/9

A computer program is described which calculates signal and clutter return and probability of detection for scanning search radars. Sample outputs are plotted showing the effects of humidity, sea state and target scintillation. Author (GRA)

N84-10437# Naval Research Lab., Washington, D. C.
RANGE RESOLUTION OF TARGETS Final Report
Gerard V. Trunk 19 Jul. 1983 24 p refs
(RR0210543)
(AD-A131065; NRL-8728) Avail: NTIS HC A02/MF A01 CSCL 17/9

Resolving targets is formulated as a hypothesis testing problem. A generalized likelihood approach is developed and positive results are obtained. Usng a sampling rate of 1.5 samples per pulsewidth, two 20-dB nonfluctuating targets an be resolved at a resolution probability of 0.9 and at a false alarm rate of 0.01, at separations varying between 1/4 and 3/4 of a pulsewidth, depending on the relative phase difference between the targets. The generalized likelihood approach was compared to several easily implemented adhoc approaches, and an ad hoc aproach involving fitting a pulse shape to the data is only slightly less accurate than the likelihood approach. GRA

N84-10438# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
A DESCRIPTION OF THE NORDA SATELLITE REMOTE SENSING HARDWARE/SOFTWARE FOR PROSPECTIVE USERS Final Report
Gerald D. Stephenson Apr. 1983 110 p
(AD-A130779; NORDA-TN-205) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document is intended to provide a general overview of the hardware and software used in the NORDA Code 335 Remote Sensing Branch. Detailed documentation of the International Imaging Systems software can be found in their System 101 Image Processing System Users Manual. A license agreement exists between NORDA and I2S that prohibits NORDA from making this software available to other facilities. Any facility that is interested in using I2S software would have to make a license agreement with I2S. Author (GRA)

N84-10439# Stanford Univ., Calif. Center for Radar Astronomy.
MULTIFREQUENCY HF RADAR OBSERVATIONS OF CURRENTS AND CURRENT SHEARS Final Report
Calvin C. Teague Jul. 1983 54 p refs
(Contract N00014-75-C-0356)
(AD-A131528) Avail: NTIS HC A04/MF A01 CSCL 17/9

Techniques were developed for using high frequency radar to measure currents and vertical current shears in the upper one or two metres of the ocean surface. The measurement of current velocity with an HF radar depends on the ability of the radar to precisely measure the phase velocity and direction of propagation of ocean waves whose wavelength is one-half the radar wavelength. In the absence of a current, the waves travel at a speed given by the still-water dispersion relation. An underlying current will modify this speed. The radar measures the actual phase velocity through a Doppler shift, and the wavelength of the ocean wave is known through the first-order Bragg scattering relation, so a difference between observed and theoretical still-water phase velocity can be calculated. In addition, longer ocean waves are affected by currents at deeper depths than are shorter ocean waves. By measuring the phase velocity at several different wavelengths, it is possible to measure a vertical current shear in the top one or two metres of the ocean surface. This is a measurement that is very difficult to make by any other means. A portable coherent, pulsed-Doppler HF radar system was developed and used in several experiments, both on land on the California coast and on board a ship during a JASIN experiment. Two different antenna systems were developed during the course of the experiments. GRA

N84-10440# Georgia Inst. of Tech., Atlanta. Energy and Material Sciences Lab.
SUPPLEMENTAL GROUNDING OF EXTENDING EMP COLLECTORS Final Report, 1 May 1980 - 31 Jan. 1982
H. W. Denny, D. W. Acree, G. B. Melson, and D. P. Millard 31 Jan. 1982 180 p refs
(Contract DNA001-80-C-0294)
(AD-A131255; DNA-5940F) Avail: NTIS HC A09/MF A01 CSCL 20/14

The external conductors of a facility, particularly long, above ground types, pose a severe EMP threat. A primary purpose of this program was to investigate the premise that supplemental ground connections in these types of conductors could serve to reduce this threat. To support this investigation an External Collector Analysis Model (ECAM) was developed. ECAM was applied to analyzing the EMP-induced current levels appearing at a facility under various conditions of line length, line height, and number of grounds. From the results, approaches to the treatment of external collector penetrations are suggested. In addition to the external collector assessments, preliminary studies of internal collector responses are reported. Supplemental studies of techniques for measuring the responses of earth electrode systems over the EMP power spectrum are described. A successful technique utilizing currently available instrumentation was used to validate a test probe and to evaluate scaled models of various commonly used earth electrode geometries. From the measurements, observations relating to the behavior of various geometries up to 500 MHz are made. Author (GRA)

N84-10441# R and D Associates, Marina Del Rey, Calif.
AN ESTIMATE OF HF/VHF SURFACE-WAVE COMMUNICATION LINK REACHES IN THE WEST GERMAN FOREST ENVIRONMENT

G. A. Gordon and E. Hoyt 1 Jan. 1982 64 p refs
(Contract DNA001-82-C-0052)
(AD-A131262; RDA-TR-119930-001; DNA-TR-82-07) Avail: NTIS HC A04/MF A01 CSCL 17/1

This report discusses the feasibility, from the standpoint of the communication link reaches attained, of using high frequency or very high frequency (HF/VHF) surface-wave links to support a nuclear survivable command and control system for NATO forces in Western Europe. The desired minimum link reach is determined by the 'nuclear-safe' separation between dispersed command and control elements. In order to estimate the link reach, we give careful attention to the effects of propagation, noise, and the link system parameters (in particular the antenna design and siting). Since much of Western Europe is forested, we have emphasized the treatment of propagation in a forest environment, a subject that is less well understood and documented than is propagation over open country. The report results indicate that the desired minimum link reach will be substantially exceeded in most cases. GRA

N84-10442# California Univ., Livermore. Lawrence Livermore Lab.
THE SINGULARITY EXPANSION METHOD APPLIED TO PLANE WAVE SCATTERING FROM A LOSSY SLAB ON A CONDUCTING HALF-SPACE Final Report
James Brian Grant 29 Apr. 1983 104 p refs
(Contract W-7405-eng-48)
(DE83-012942; UCRL-15532) Avail: NTIS HC A06/MF A01

The one dimensional electromagnetic scattering from an idealized, conductor backed lossy slab which can be expressed as an infinite sum of natural modes by applying the singularity expansion method (SEM) is discussed. The slab is homogeneous, isotropic, of uniform thickness, and infinite in extent. A close equivalence to this system is a shorted, lossy transmission section. The complex frequencies for the lossy scatterer are continuous functions of the parameters describing the scatterer. It is shown that only a finite number of the SEM poles can be purely imaginary and that there can be no purely real poles. A numerical implementation of the SEM series was validated by comparison to a digital inverse Fourier transform of the solution to the fields in the frequency domain. Examples of the numerically found SEM poles for different slabs are included. DOE

N84-10443# Stanford Linear Accelerator Center, Calif.
TRANSIENT HIGH-FIELD BEHAVIOR OF NIOBIUM SUPERCONDUCTING CAVITIES
I. E. Campisi, Z. D. Farkas, H. Deruyter, and H. A. Hogg Mar. 1983 3 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-011852; SLAC-Pub-3074; CONF-830311-158) Avail: NTIS HC A02/MF A01

The breakdown behavior of a TM010 mode, S-band niobium cavity at low temperatures was examined. Unloaded Q's of 9 x 10(7) at 4.2 K and of 7 x 10(9) at 1.35 K were measured. The response of the cavity at 4.2 K to 1 MW, 2.5 (SIGMA)s pulses was tested in several cool downs. In these tests the cavity was heavily overcoupled to lower its time constant to a value of 0.80 times the RF pulse length of 2.5 (SIGMA)s. This condition maximizes the energy transfer from the klystron source to the cavity. It is indicated that fields of about 50 MV/m are reached in the cavity without breakdown. DOE

N84-10444# California Univ., Los Angeles.
PROJECT SCATTERING OF ELASTIC WAVES Final Technical Report, 1 Jan. 1981 - 30 Sep. 1982
A. K. Mal 1982 448 p refs Prepared in cooperation with California Univ., Livermore, Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE83-013574; UCRL-15501) Avail: NTIS HC A19/MF A02

Solutions of a number of crack diffraction problems which have potential applications in the ultrasonic nondestructive evaluation of structural elements were generated. Only simplified prototype problems were considered so that their solutions could be obtained without recourse to highly elaborate numerical schemes. The emphasis was on obtaining accurate results for idealized geometries which could serve as standards for evaluating numerical or other approximate solutions of more realistic and complex models. Problems considered were: diffraction of normally incident P waves by circular cracks, diffraction of elastic waves by a finite crack within or on a half space, diffraction of body and surface waves at high frequencies by an edge crack in a plate, and the surface response of a layered half space to dislocation sources. DOE

N84-10445# California Univ., Livermore. Lawrence Livermore Lab.
LECTURE NOTES FOR BULK AND HOURGLASS VISCOSITIES IN WAVE PROPAGATION CODES
J. O. Hallquist 6 May 1983 22 p refs Lecture presented at Struct. Dyn. Meeting, Ispra, Italy, 16 May 1983
(Contract W-7405-eng-48)
(DE83-013042; UCRL-89156; CONF-830582-2) Avail: NTIS HC A02/MF A01

Viscosities, bulk and hourglass, are employed in most finite element and finite difference wave propagation codes and serve two distinct, unrelated functions. Bulk viscosities are used to treat shock waves. Proposed in one spat dimension by von Neumann and Richtmyer in 1950, the bulk viscosity method has since been used by nearly all developers of wave propagation codes. A viscous term, q, added to the pressure, has the effect of smearing shock discontinuities into rapidly varying but continuous transition regions. With this method the solution is unperturbed away from shocks, the Hugoniot jump conditions remain valid across the shock transition, and shocks are automatically treated wherever they arise in the solution. This discussion of bulk viscosity draws heavily on works by Richtmyer and Morton, Noh, and Wilkins. DOE

N84-10446# National Bureau of Standards, Boulder, Colo. Wave Propagation Lab.
MEASURED IONOSPHERIC DOPPLER SPREADING OF HF GROUND BACKSCATTER
R. M. Jones, J. P. Riley, and T. M. Georges Mar. 1983 170 p refs
(PB83-220764; NOAA-TM-ERL-WPL-109; NOAA-83061501) Avail: NTIS HC A08/MF A01 CSCL 17I

Doppler spectra from ionospherically propagated ground backscatter are presented. These spectra show how the ionosphere distorts HF backscatter radio waves by frequency speading. The ground backscatter spectra presented here show that ionospheric Dopper spreading is so ubiquitous that its effect should never be disregarded, even when a narrow azimuth beam radar such as ours is used. Nevertheless, Doppler spreading varies so quickly that it usually pays to wait for it to diminish. Author (GRA)

N84-10447# National Oceanic and Atmospheric Administration, Miami, Fla. Research Facilities Center.
EMPIRICAL STUDY OF HF AIR TO GROUND COMMUNICATIONS AT THE RESEARCH FACILITIES CENTER BASED ON RADIO LOGS, 1973 - 1982
Francis J. Merceret May 1983 49 p refs
(PB83-222588; NOAA/TM/ERL/RFC-12; NOAA-83062205) Avail: NTIS HC A03/MF A01 CSCL 17B

Radio logs documenting HF air to ground radio transmissions between the RFC and its aircraft are examined for frequency usage. A wide range frequencies is necessary to maintain reliable communications. Certain frequencies are shown to be more useful than others at certain ranges and tims of day. Details are given. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-10448# Overseas Relations Branch Translation Service, London (England).
TRANSIENT OVERVOLTAGES ON CABLE SHEATHS
H.-G. Dabringhaus 9 Aug. 1983 16 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (West Germany), v. 82, no. 3, 31 Jan. 1983 p 57-60
(BLL-OA-Trans-2620-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

Transient overvoltage on the sheaths of high voltage cables with single point sheath earthing or cross bonding of the cable sheaths involve danger for the cable and the joints. The investigations of transient overvoltages in the case of a switching operation on a 110 kV single core oil filled cable with single sided sheath earthing are reported. A comparison between measured transient voltage variations and those calculated with the help of a traveling wave analyzer program shows very good agreement. The investigations showed that with single point sheath earthing, the unearthed sheath end ought to be protected against overvoltages. S.L.

N84-10449# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
DESIGN CONDITIONS FOR FAIL SAFE QUENCHING OF A HIGH CURRENT DENSITY SUPERCONDUCTING SOLENOID WITH A SHORTED SECONDARY CIRCUIT
M. A. Green Sep. 1982 109 p refs
(Contract DE-AC03-76SF-00098)
(LBL-14859) Avail: NTIS HC A06/MF A01

The key to fail safe quenching of large high current density superconducting magnets without external quench protection is to make the whole magnet become normal quickly. In large high current density superconducting magnets, quench propagation in the coil often does not cause the coil to become normal fast enough to insure quenching without burnout. If a shorted secondary circuit is added, the process of the magnet turning normal is speeded up through the process we call quench back. The quench back process is discussed. The parameters which affect thermal quench back are examined. Ways of speeding up the quench back process so that fail safe quenching can be achieved even in very large high current density magnets are presented. Theoretical calculations are made to illustrate the effect of various parameters on quench back time and the ability for the coil to quench safely.
Author

N84-10450*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
IMPROVED TRANSISTOR-CONTROLLED AND COMMUTATED BRUSHLESS DC MOTORS FOR ELECTRIC VEHICLE PROPULSION Final Report
N. A. Demerdash, R. H. Miller, T. W. Nehl, and T. A. Nyamusa 1 Jan. 1983 402 p refs
(Contracts DEN3-65; DE-AI01-77CS-51044)
(NASA-CR-168053; DOE/NASA/0065-83/1; NAS 1.26:168053) Avail: NTIS HC A18/MF A01 CSCL 09C

The development, design, construction, and testing processes of two electronically (transistor) controlled and commutated permanent magnet brushless dc machine systems, for propulsion of electric vehicles are detailed. One machine system was designed and constructed using samarium cobalt for permanent magnets, which supply the rotor (field) excitation. Meanwhile, the other machine system was designed and constructed with strontium ferrite permanent magnets as the source of rotor (field) excitation. These machine systems were designed for continuous rated power output of 15 hp (11.2 kw), and a peak one minute rated power output of 35 hp (26.1 kw). Both power raings are for a rated voltage of 115 volts dc, assuming a voltage drop in the source (battery) of about 5 volts. That is, an internal source voltage of 120 volts dc. Machine-power conditioner system computer-aided simulations were used extensively in the design process. These simulations relied heavily on the magnetic field analysis in these machines using the method of finite elements, as well as methods of modeling of the machine power conditioner system dynamic interaction. These simulation processes are detailed. Testing revealed that typical machine system efficiencies at 15 hp (11.2 kw) were about 88% and 84% for the samarium cobalt and strontium ferrite based machine systems, respectively. Both systems met the peak one minute rating of 35 hp. S.L.

N84-10451*# Watkins-Johnson Co., Palo Alto, Calif.
DESIGN, CONSTRUCTION AND LONG LIFE ENDURANCE TESTING OF CATHODE ASSEMBLIES FOR USE IN MICROWAVE HIGH-POWER TRANSMITTING TUBES Interim Report
R. Gorshe Dec. 1982 89 p
(NASA-CR-168112; NAS 1.26:168112; IR-5) Avail: NTIS HC A05/MF A01 CSCL 09A

The ability of state of the art cathode types to produce current densities of 2A/sq cm, respectively, over a minimum designed life of 30,000 hours of continuous operation without failures was demonstrated. The performance of the state of the art cathode types was evaluated by endurance testing while operating under identical electrical geometrical, and vacuum conditions that realistically duplicate the operating conditions present in a transmitter tube. Although there has been considerable life testing done on high current density types of cathodes, these have beem primarily limited to diodes. A diode and High power microwave tube are grossly different devices. A comparison of these two devices is provided. A diode and high power microwave tube are quite different; one could therefore assume different internal environments, especially in the cathode region. Therefore, in order to establish life capabilities of the cathodes just mentioned, they should be tested in a vehicle which has an internal environment similar to that of a high power microwave tube. S.L.

N84-10452*# National Aeronautics and Space Administration, Washington, D. C.
FLEXIBLE COMPOSITE FILM FOR PRINTED CIRCUIT BOARD
Kenji Yabe, Masayoshi Asakura, Hirofumi Tanaka, and Atsuhiko Soda Aug. 1982 14 p Transl. into ENGLISH of Japanese Patent no. 50-96900 (27 Dec. 1973) p 491-497 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77109; NAS 1.15:77109) Avail: NTIS HC A02/MF A01 CSCL 09A

A flexible printed circuit for a printed circuit board in which layers of reaction product composed of a combination of phenoxy resin - polyisocyanate - brominated epoxy resin, and in which the equivalent ratio of those functional groups is hydroxyl group: isocyanate group: epoxy group - 1 : 0.2 to 2 : 0.5 to 3 are laminated on at least one side of saturated polyester film is discussed.
Author

N84-10453# Virginia Univ., Charlottesville. Dept. of Electrical Engineering.
OPTIMAL CONSTRAINED REPRESENTATION AND FILTERING OF SIGNALS
Dimitri Kazakos Jan. 1983 20 p refs
(Grant AF-AFOSR-0030-82; AF Proj. 2304)
(AD-A129157; UVA/525634-EE83-108; AFOSR-83-0465TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A random signal is observed in independent random noise. The author is addressing the problem of finding the optimum signal estimate that is constrained to lie in a given linear subspace. The optimality is defined in the sense of weighted mena square error. In the second step, the author finds the optimum linear subspace of given dimensionality. It is shown to be the linear manifold spanned by the eigenvectors of the simultaneous diagonalization

of the signal and noise covariance, that correspond to the largest eigenvalues. The result is valid for both discrete and continuous time. For large observation time and stationary signals, it is shown that the constrained optimal estimate is determined by the two spectral densities and a weighted Fourier Transform of the noise observations. The above result applies to both discrete time and continuous time signals. The Wiener filter emerges as a special case of the constrained filtering estimate, when the linear subspace is enlarged to coincide with the total measurement space.
Author (GRA)

N84-10454# Harry Diamond Labs., Adelphi, Md.
PHYSICAL AND COMPUTER MODELING OF MILITARY EARTH GROUNDING PRACTICES IN A HEMP (HIGH-ALTITUDE ELECTROMAGNETIC PULSE) ENVIRONMENT
Andrew A. Cuneo, Jr., James J. Loftus, and Rodney A. Perala Jun. 1983 22 p refs
(Contract MIPR-HC1001-9-400)
(AD-A130141; HDL-TM-83-6) Avail: NTIS HC A02/MF A01 CSCL 20/3

Military grounding practices compatible with hardening electronic systems to high-altitude electromagnetic pulse (HEMP) illumination are considered. This study concerns the grounding practices outlined in MIL-STD-188-124, Common Long-Haul/Tactical Communications Systems. Three standard grounding schemes and one new scheme were chosen for study at a 10:1 scale, illuminated by a 59-V/m peak simulated HEMP. There were several significant results: (a) The theoretical technique in general agrees to within a factor of three with the experimental results, (b) The type end of earth ground system does not appear to be important, and (c) Intrasite transients tend to be dominated by electromagnetic coupling to completed conductive loops. When the loop is broken, the transient is characterized by the half-wavelength resonance of the conductor. Grounding paths which do not form part of the loop do not contribute significantly to the transient in the loop.
Author (GRA)

N84-10455# Hughes Aircraft Co., Culver City, Calif. Electro-Optical and Data Systems Group.
DEVELOPMENT OF A GENERATOR STATOR INSULATION SYSTEM Final Report
Robert S. Buritz Apr. 1983 152 p refs
(Contract DAAK70-79-C-0131)
(AD-A130376; FR-83-76-686; HAC-REF-E5112) Avail: NTIS HC A08/MF A01 CSCL 10/2

The insulation of stator windings in generators is an old technology, dating to the turn of the century with kraft paper insulated, oil filled cables. Recently, two new classes of machines requiring much more advanced techniques of insulation have emerged. These generators are designed for relatively short duty in situations where light weight and small size are crucial to the overall mission, and mobility is a must. One class of machines uses superconducting windings to achieve small size. The other class consists of conventional generators designed to have extremely high power densities and specific powers. These machines represent a considerable engineering achievement, being significantly smaller than any previous generator. In one of these generators, manufactured by Bendix, substantial problems have been encountered in the stator winding insulation, because of the high fields dictated by the extremely high power density. This report presents the Hughes Aircraft Company approach and solution to these problems.
GRA

N84-10456# Naval Research Lab., Washington, D. C. Communications Systems Engineering Branch.
THE 2400- TO 800-B/S LPC (LINEAR PREDICTIVE CODER) RATE CONVERTER Final Report
L. J. Fransen 16 Jun. 1983 24 p refs
(AD-A129825; NRL-8716) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report presents a means for achieving an 800-bits per second (b/s) speech communication capability by redigitizing the linear predictive coefficients present in the 2400-b/s data stream produced by the narrowband transmitter currently under development by the Department of Defense and private industry. The 2400- to 800-b/s rate converter uses a vector quantization scheme to achieve most of the data reduction. This approach makes it possible to interconnect, without user intervention, 2400- and 800-b/s users (although both users would be effectively at the lower rate) via rate converters located somewhere along the link. The intelligibility of the synthesized speech produced by this procedure compares well with other existing very-low-data-rate systems as determined by the Diagnostic Rhyme Test.
Author (GRA)

N84-10457# JAYCOR, Alexandria, Va.
DIODE DYNAMICS, BEAM GENERATION AND TRANSPORT AND PLASMA EROSION OPENING SWITCH DEVELOPMENT Final Report, 14 Jan. 1980 - 14 Apr. 1983
P. F. Ottinger 17 May 1983 677 p refs
(Contract N00173-80-C-0202; JAYCOR Proj. 6188)
(AD-A129821; JAYCOR-J207-83-C-001) Avail: NTIS HC A99/MF A01 CSCL 09/1

This document summarizes a research program in the areas of diode physics, beam transport and plasma erosion opening switches. Each of these areas are outlined and reports are provided for details.
Author (GRA)

N84-10458# Naval Surface Weapons Center, White Oak, Md. Radiation Div.
HIGH SPACE HARMONIC PERTURBATIONS IN TRAVELING WAVE TUBES
Han S. Uhm, Joon Y. Choe, and Chung M. Kim 7 Jan. 1983 33 p refs
(AD-A130204; AD-F500165; NSWC/TR-83-66;
PLASMA-PHYSICS-PUB-83-01) Avail: NTIS HC A03/MF A01 CSCL 09/1

Stability properties of the free streaming mode in an electron beam propagating through a cylindrical waveguide loaded with a tape helix are investigated, including influence of high space harmonic perturbations. Closed algebraic dispersion relation of the free streaming mode are obtained. Properties of the high space harmonic perturbations are numerically investigated in connection with application on a high frequency microwave amplifier. One of the most important features in this analysis is that instability of high harmonic perturbations occurs at a very large value of microwave frequency. In this regard, millimeter microwave can be easily attainable by reducing the helix radius to a subcentimeter.
GRA

N84-10459# Oklahoma State Univ., Stillwater. Electronics Lab.
SWITCHABLE 10-BIT PCM DECODER
R. F. Buck 20 Feb. 1983 51 p refs
(Contract F19628-81-C-0079; AF Proj. 7659)
(AD-A130461; AFGL-TR-83-0069; SR-2) Avail: NTIS HC A04/MF A01 CSCL 09/3

This report describes a portable, self-contained switchable 8-channel 10-bit PCM decoder, designed as a complementary item of dedicated test equipment for use in checkout and qualification testing of airborne PCM encoders, constructed for use in the 'falling sphere' class of atmospheric density experiments. The system provides 8 channels of analog output data, suitable for use in stripchart recording. Six of these channels are switchable to any desired digital word within the data stream; one switchable channel is additionally provided with a 10-bit binary display for the digital data in the selected word. A second switchable channel also permits decommutation of subcommutated housekeeping data within word 15 of the PCM data. A parallel digital data output is provided to allow interface with automated testing equipment for qualification testing. The report also provides detailed data concerning the computer-controlled automatic temperature qualification test procedure used in certifying the airborne apparatus for flight, including the step-by-step routine to be followed in performing the tests.
Author (GRA)

N84-10460# Georgia Inst. of Tech., Atlanta. Lab. for Electronics Technology.
MODELING OF PARASITIC EFFECTS IN DISCRETE PASSIVE COMPONENTS Final Technical Report, Sep. 1978 - Jan. 1980
J. A. Woody Griffiss AFB, N.Y. RADC Feb. 1983 170 p refs
(Contract F30602-78-C-0230; AF Proj. 2338)
(AD-A130458; RADC-TR-83-32; GIT/EES-A-2226-F) Avail: NTIS HC A08/MF A01 CSCL 09/1

This program was performed to improve the capabilities for modeling of passive components in computer-aided analysis of electronic circuits at frequencies up to 1 GHz. Techniques were developed to generate models that predict the parasitic behavior of discrete passive components. Both manufacturers' and measured data were used on this program. The data available from manufacturers were surveyed and classified. This data is generally limited to frequencies less than 100 MHz; it was used to develop appropriate modeling techniques for these frequencies. In addition, measurement techniques were identified for obtaining the necessary data and modeling techniques were developed for frequencies up to 1 GHz. Examples of the modeling techniques are presented and the resulting recommended modeling techniques for use with various types of components and data are summarized. It is concluded that at frequencies up to 1 GHz passive components can be accurately modeled with simple 3-element models.
Author (GRA)

N84-10461# Naval Biodynamics Lab., New Orleans, La. Bureau of Medicine and Surgery.
A HIGH-PERFORMANCE ANALOG-TO-DIGITAL CONVERSION SUBSYSTEM SUITABLE FOR THE STUDY OF EVOKED POTENTIALS, WITH DESIGN CONSIDERATIONS FOR THE ECLIPSE $140 (TRADEMARK) COMPUTER
Michael D. Berger Feb. 1983 41 p
(AD-A130353; NBDL-83R001) Avail: NTIS HC A03/MF A01 CSCL 09/5

In order to evaluate impact protection devices, an impact injury model for restrained humans in a crash environment must be developed. Disruption of the functioning of the central nervous system is an important consequence of impact injury involving the head and neck, and is an important consideration in the development of a useful impact-injury model. Ultimately, neurophysiological criteria are desired. Evoked potentials (EPs) are likely to provide appropriate neurophysiological information, but quantitative analysis of EP data presents considerable difficulty. Among the technical problems encountered is efficient digitization of large amounts of EP data presents considerable difficulty. Among the technical problems encountered is efficient digitization of large amounts of EP data. This report presents detailed specifications for a high-performance analog-to-digital conversion subsystem suitable for various aspects of such work. Procedures utilizing various aspects of the design presented have been have been found to be effective. In the future acquisition of A/D conversion hardware, the design presented here should be considered. Author (GRA)

N84-10462# California Univ., Berkeley.
LOW-INPUT-HARMONICS POWER SUPPLIES Final Contractor Report
Chenming Hu Oct. 1982 55 p ref
(Contract N66001-81-C-0538)
(AD-A130337; NOSC-CR-159) Avail: NTIS HC A04/MF A01 CSCL 09/1

This final report covers Phase I of the project. All three objectives have been successfully accomplished. They are (a) construction of a low-input-harmonics converter, (b) characterization of the input current harmonics, and (c) theoretical analysis of the input harmonics and other performances of the novel converter. Specifically, it has been shown that the 3% harmonics requirement can be met without the use of low frequency filters or phase-shifting transformers. This circuit can not perform ac to dc conversion. Pending continued funding of Phase II of this project, a 3-phase ac to dc power converter will be demonstrated. A new circuit having even lower input harmonics and much lower switching frequency noises than the circuit reported here will be constructed and characterized. Harmonics contents and stability of the power supply will be thoroughly studied. Author (GRA)

N84-10463# E-Systems, Inc., St. Petersburg, Fla. ECI Div.
A 500-WATT SOLID-STATE RF POWER AMPLIFIER AM-7209() /VRC Quarterly Report, 15 Dec. 1982 - 15 Mar. 1983
M. Balasis, W. Boller, W. Coleman, M. Harris, L. Strickland, and F. Woodworth 18 Mar. 1983 182 p refs
(Contract DAAB07-82-C-J231; DA Proj. 1X4-63707-D-437)
(AD-A129327; CECOM-82-C-J231; GO-1289-2; QR-2) Avail: NTIS HC A09/MF A01 CSCL 17/2

The development, fabrication, and test of three advanced development model 500-watt VHF power amplifiers to be used to increase the output of presently-deployed RT-524 (VRC-12) VHF radios and future equipment such as the frequency hopping SINCGARS-V equipment is documented in this report. The power amplifier, as defined in US Army Communications-Electronics Command contract DAAB07-82-C-J231, is a state-of-the-art stand-alone design utilizing a combination of the latest design techniques in RF elements, control circuits, packaging techniques, and amplifier architecture. GRA

N84-10464# Princeton Univ., N. J. Information Sciences and Systems Lab.
SUBOPTIMAL THRESHOLD DETECTION IN NARROWBAND NON-GAUSSIAN NOISE
Kenneth S. Vastola and Stuart C. Schwartz 1983 7 p refs
(Contract N00014-81-K-0146)
(AD-A129629) Avail: NTIS HC A02/MF A01 CSCL 09/4

The Middleton Class A narrowband non-Gaussian noise model is considered. The performance of various simple suboptimum threshold detectorss is examined and compared with the performance of the optimum detector. For example, it is shown that for most cases of interest the blanker has nearly optimal performance while the soft limiter and hard limiter have substantially less than optimal performance. Then, a new approximation of the locally optimum detector nonlinearity is developed using ideas from the theory of robust detection. Author (GRA)

N84-10465# Sandia Labs., Albuquerque, N. Mex.
RAVEN, A 5-jK, 1.5-MV REPETITIVE PULSER
G. J. Rohwein 1983 4 p refs Presented at the IEEE Power Electronics Specialists Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013643; SAND-83-0121C; CONF-830621-19) Avail: NTIS HC A02/MF A01

RAVEN, a 5 kJ, 1.5 MV repetitive pulser, was built to test the performance of high voltage transformer pulse charging systems. The pulser has a 4 nF water insulated, pulse forming line which is charged by a bipolar primary capacitor bank through a voltage step up pulse transformer. Both the primary capacitor and high voltage output switches are gas dynamic spark gaps which were operated at sustained pulse rates up to 20 pps. The system operates with an overall energy transfer efficiency slightly better than 90%. A description of the system and its performance characteristics will be discussed. Specific design features of the switches and transformer will also be included. DOE

N84-10466# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
CHARACTERIZATION OF p-TYPE CdTe ELECTRODES IN ACETONITRILE/ELECTROLYTE SOLUTIONS. NEARLY IDEAL BEHAVIOR FROM REDUCTIVE SURFACE PRETREATMENTS Interim Technical Report
Henry S. White, Antonio J. Ricco, and Mark S. Wrighton 30 Jun. 1983 48 p refs Submitted for publication
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A130764; TR-39-ONR) Avail: NTIS HC A03/MF A01 CSCL 09/1

Single crystal p-CdTe (Eg equal 1.4 eV) electrodes have been characterized in CH3CN/electrolyte solutions. Deliberate modification of the p-CdTe surface by etching in strongly oxidizing (Cr2072-/HNO3) or reducing (S2042-/OH-) solutions alters the

p-CdTe surface to give rise to large differences in the electrochemical response in the dark and under illumination. The oxidative pretreatment apparently yields a p-CdTe surface that is Fermi level pinned, whereas the reductive pretreatment yields nearly ideal response. The pretreated electrodes were characterized by XPS, impedance measurements, and cyclic voltammetry in the presence of a number of reversible, one-electron redox couples. XPS indicates the presence of a number of reversible, one-electron redox couples. XPS indicates the presence of a Te-rich surface overlayer, composed of Te0 and Te02, on CdTe etched in oxidizing media. Electrodes etched in reducing solutions yield XPS spectra nearly identical to those of an Ar ion-sputtered CdTe sample, in terms of stoichiometry (1:1) and chemical state (Cd2+ and Te2-) of cadmium and telluride. GRA

N84-10467# Defense Electronics Supply Center, Dayton, Ohio.
MINUTES OF FSC 5935, CONNECTOR STANDARDIZATION PLANNING MEETING
30 Nov. 1982 187 p Meeting held in Dayton, Ohio, 25-27 Aug. 1982
(AD-A130681) Avail: NTIS HC A09/MF A01 CSCL 09/1

This report contains the minutes of the Electrical Connector Standardization Meeting held 25-27 Aug 82. GRA

N84-10468# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM AND T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Jan. - 31 Mar. 1983
F. M. Bruno 30 Apr. 1983 13 p
(Contract DAAK70-80-C-0168)
(AD-A131042; QR-10; TEI-A009-10) Avail: NTIS HC A02/MF A01 CSCL 09/1

TEI corrected two out-of-spec parameters (detected in the CRT assemblies being processed in preparation for Phase II - Confirmatory Samples) by making minor adjustments to its processing and inspection procedures. The updated ATP and QTP were filed in the Word Processor store and were ready to become the basis of several CDRL items when required. Contract Line Item A003, Drawings, Engineering, and Associated Lists, was submitted in draft form to the COR. Process Specifications were being refined for incorporation into Contract Line Item A002, Type D, Specifications. Author (GRA)

N84-10469# Stanford Univ., Calif. Dept. of Electrical Engineering.
RESEARCH ON ALGORITHMS FOR ADAPTIVE ARRAY ANTENNAS Final Technical Report, Feb. 1981 - Nov. 1982
Bernard Widrow and R. Gooch Griffiss AFB, N.Y. RADC Mar. 1983 15 p refs
(Contract F30602-80-C-0046; AF Proj. 2305)
(AD-A131064; RADC-TR-83-35) Avail: NTIS HC A04/MF A01 CSCL 09/5

Conventional adaptive array processing is accomplished by linearly combining the outputs of tap delay lines attached to each sensor of an array. This type of processing can be interpreted as using an 'all-zero' filter at each sensor to generate a frequency-dependent magnitude and phase shift (weighting) over the operating bandwidth of the array. A new array processing method is presented which uses filters possessing both poles and zeros to perform the frequency-dependent weighting. Adaptation of these filters is based on minimization of the 'equation error' rather than the true output error. Ramifications of the equation error approach to array processing are discussed. The idea of constrained array processing is discussed and an optimal array weighting formula is derived. The effects of thermal noise on optimal array weighting and pole and zero filtering is presented. Through computer simulations, the pole nulls while using the same total number ot weights as an 'all zero' filter. The method is expected to be useful in many seismic, acoustic, and electromagnetic array processing applications. GRA

N84-10470# University of Southern California, Los Angeles. Electronic Sciences Lab.
RESEARCH IN ELECTRONICS: JOINT SERVICES ELECTRONICS PROGRAM Annual Technical Report, 1 Apr. 1982 - 31 Mar. 1983
William H. Steier 30 Apr. 1983 140 p refs
(Contract F49620-81-C-0070; AF Proj. 2305)
(AD-A130791; AFOSR-83-0617TR) Avail: NTIS HC A07/MF A01 CSCL 05/1

This annual technical report summarizes accomplishments and progress of fifteen (15) projects (work units) which were active during all or part of the reporting period of 1 April 1982 to 31 March 1983 under contract F49620-81-C-0070 at the Electronic Sciences Laboratory of the University of Southern California under the Joint Services Electronics Program. GRA

N84-10471# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
COMPUTATION OF COUNTING DISTRIBUTIONS ARISING FROM A SINGLE-STAGE MULTIPLICATIVE PROCESS Interim Report
Carl W. Helstrom and Stephen O. Rice 2 May 1983 54 p refs
(Grant AF-AFOSR-0343-82; AF Proj. 2304)
(AD-A131480; AFOSR-83-0677TR) Avail: NTIS HC A04/MF A01 CSCL 09/1

The cumulative distribution of the number of secondary electrons in a single-stage photomultiplier is calculated by numerically integrating the inversion integral for its probability generating function along a suitably chosen contour. A residue series applicable in certain cases is also presented. Saddlepoint approximations to the contour integral are described, which are the more accurate, the greater the numbers of secondaries. Recurrent relations are developed for computing values of the distribution for purposes of comparison. Computation of the Neyman Type-A distribution is treated as a limiting case. Author (GRA)

N84-10472# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESTRUCTURABLE VLSI PROGRAM Semiannual Technical Summary Report, 1 Oct. 1982 - 31 Mar. 1983
Peter E. Blankenship 31 Mar. 1983 53 p refs
(Contract F19628-80-C-0002; ARPA Order 3797)
(AD-A131246; ESD-TR-83-024) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report describes work performed on the Restructurable VLSI Program sponsored by the Information Processing Techniques Office of the Defense Advanced Research Projects Agency during the semiannual period 1 October 1982 through 31 March 1983. Author (GRA)

N84-10473# Sandia Labs., Albuquerque, N. Mex.
ZINC/BROMINE PROTOTYPE-BATTERIES EVALUATION
P. C. Butler and D. W. Miller 1983 6 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-011861; SAND-83-0009C; CONF-830812-13) Avail: NTIS HC A02/MF A01

Prototype flowing electrolyte batteries were tested. Zinc/bromine batteries from Exxon Research and Engineering Company and from Energy Research Corporation (ERC) are evaluated. The batteries were tested for battery cycle histories, electrochemical efficiencies, parametric test data, and failure analysis results. DOE

N84-10474# Sandia Labs., Albuquerque, N. Mex.
A 2-MJ STAGED EXPLOSIVE GENERATOR
E. C. Chare, R. J. Kaye, and M. Cowan 1982 3 p refs Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013677; SAND-83-0046C; CONF-830621-18) Avail: NTIS HC A02/MF A01

A self contained, three stage explosive generator is described. The system has produced 2 MJ of magnetic energy in a 40 nH load with a peak VI product of 0.2 TW. Current in the load rises from zero to peak value in 50 (SIGMA)s, the later part of the rise

is approximately exponential with 10 (SIGMA)s e-fold time. Support equipment (power supply, initial energy capacitor bank, detonator firing units, delay generators, and Freon gas supply) can be protected from destructive effects of the explosive generators and reused. DOE

N84-10475# State Univ. of New York, Buffalo.
REVIEW OF REPETITIVE-PULSE-POWER COMPONENT TECHNOLOGY
W. J. Sarjeant and G. J. Rohwein (Sandia Labs, Albuquerque, N. Mex.) 1983 15 p refs Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-011784; SAND-83-0351C; CONF-830621-2) Avail: NTIS HC A02/MF A01

Critical components for pulsed power systems are reviewed. Components and materials requiring significant development efforts are emphasized. Capacitors are one of the weakest elements in high power pulsed systems especially when operated at high repetition frequencies for extended periods of time. Switches are the weakest active components in pulse power systems. Improved insulation in systems and components is essential to increasing energy density and reliability. Results of recent capacitors and switch experiments are discussed and developments in switch and pulse transformer design are reviewed. DOE

N84-10476# Ebasco Services, Inc., New York.
METHODOLOGY FOR INTEGRATION OF HVDC LINKS IN LARGE ac SYSTEMS. PHASE 1: REFERENCE MANUAL Final Report
R. J. Meredith Mar. 1983 347 p refs
(EPRI Proj. 1964-1)
(DE83-902302; EPRI-EL-3004) Avail: NTIS HC A15/MF A01

HVDC transmission was found to be an attractive alternative to ac transmission in many situations. Evaluations of HVDC alternatives include technical, economic, environmental and sometimes regulatory considerations which are different than those for ac transmission. This research project resulted in the preparation of a HVDC reference manual which describes a comprehensive methodology for evaluating HVDC alternatives in utility transmission planning. Basic background information about existing HVDC systems is provided. The types of studies required and protential problems which must be dealt with are described. Also how the studies are usually run and what system modeling is required are discussed. Emphasis is place on the importance of proper control of the dc system and examples of control systems which were used were provided. DOE

N84-10477# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE OF THE PERFLUOROCARBON LIQUID/PLASTIC FILM CAPACITOR TECHNOLOGY IN REPETITIVE DISCHARGE PULSE POWER SERVICE
G. H. Mauldin (SNL), W. C. Nunnally, M. C. Thompson, and W. J. Sarjeant (New York State Univ.) 1983 4 p refs Presented at the IEEE Power Electronics Specialists Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012502; SAND-83-0122C; CONF-830621-4) Avail: NTIS HC A02/MF A01

A unique capacitor technology was developed. This technology is based upon impregnation of plastic film capacitor rolls with perfluorocarbon insulating liquids. A 300-kW capacitor modulator was installed and activated. A current status report of the continuing program is presented. DOE

N84-10478# Sandia Labs., Albuquerque, N. Mex.
A SURVEY OF THE STATE-OF-THE-ART IN AGING OF ELECTRONICS WITH APPLICATION TO NUCLEAR-POWER-PLANT INSTRUMENTATION
R. T. Johnson, Jr., F. V. Thome, and C. M. Craft Feb. 1983 68 p refs
(DE83-012696; NUREG/CR-3156) Avail: NTIS HC A04/MF A01

Research on aging of electronics in nuclear power plants is evaluated. The emphasis is on aging of electronics (e.g., semiconductors, capacitors, resistors) used in safety related Class 1E instrumentation, particularly those used in harsh environments. Some attention is also given to encapsulants, printed circuit boards and bonds (e.g., solder joints) since they are integral parts of circuits. Candidate electronic components were selected. The aging environment was defined and an effort to determine the state of the art in aging degradation was initiated. Follow on investigations and research was recommended and the first steps in defining a program on accelerated aging was outlined. DOE

N84-10479# Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH, DEVELOPMENT AND DEMONSTRATION OF NICKEL-IRON BATTERIES FOR ELECTRIC-VEHICLE PROPULSION Annual Report, 1982
May 1983 258 p
(Contract W-31-109-eng-38)
(DE83-015755; ANL/OEPM-83-8) Avail: NTIS HC A12/MF A01

The development of nickel-iron batteries was addressed to demonstrate improved performance features in electric vehicle battery systems. Performance improvements reported include: 30% increase in gravimetric energy density to 57 Wh/kg, 70% increase in volumetric enegy density to 116 Wh/1, and 5% increase in power density to 105 W/kg. In addition, a preliminary design was established for a multicell modular package that can further enhance these performance parameters by providing weight and volume reductions. Additional accomplishments are reported in process development by operating pilot line facilities to demonstrate the potential for $80/kWh OEM selling price. The potential for meeting the cycle life goal was enhanced by demonstration of: iron electrode life of over 1000 cycles at 80% depth of discharge (DOD), nickel electrode life of over 1000 cycles at 80% DOD, cell life of over 1000 cycles at 80% DOD, and 5-cell module life of 903 cycles at 80% DOD. DOE

N84-10480# Stanford Linear Accelerator Center, Calif.
NEW CONTROL SYSTEM FOR THE SLAC ACCELERATOR KLYSTRONS FOR SLC
R. K. Jobe and M. J. Browne Mar. 1983 3 p refs Presented at Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-012706; SLAC-Pub-3077; CONF-830211-161) Avail: NTIS HC A02/MF A01

A general overview of a new control system for SLAC klystrons is presented along with a detailed description of the remote controller for measurement and control of accelerator components. DOE

N84-10481# Los Alamos Scientific Lab., N. Mex.
DESIGN OF A 20-MJ COAXIAL GENERATOR
F. S. Felber (Western Research Corp., San Diego, Calif.), R. S. Caird, C. M. Fowler, D. J. Erickson, B. I. Freemen, and J. H. Coforth 1983 25 p refs Presented at the 3rd Intern. Conf. on Magagauss Magnetic Field Generation and Related Topics, Novosibirsk, USSR, 13-17 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014152; LA-UR-83-1557; CONF-830606-11) Avail: NTIS HC A02/MF A01

A design is presented for an explosive driven sweeping wave coaxial generator. The generator is required to deliver 20 MJ to a 10 nH load with a final current doubling time of 10 (SIGMA)s. A simple model of the armature motion taken into account both the explosive drive and the back pressure of the magnetic field. Shock and diffusion losses are combined in a self consistent manner with the armature dynamics to give a circuit model for the generator. The scaling of this design to higher energies is discussed. DOE

N84-10482# Westinghouse Research and Development Center, Pittsburgh, Pa.
IRON-AIR BATTERY DEVELOPMENT Final Report
2 Mar. 1983 507 p refs
(Contract W-7405-eng-48)
(DE83-015842; UCRL-15543) Avail: NTIS HC A22/MF A01

To date, air electrodes exceeded 500 discharge cycles. Fundamental studies for new structures, additions and catalysts show promising results. Failure analysis studies are discussed. Attempts to establish an accelerated life test procedure were unsuccessful. Several iron-air cell tests using available iron electrodes to demonstrate system compatibility are presented. Analysis of the auxiliary subsystem required for thermal control and electrolyte maintenance indicates that the subsystem requirements are compatible with the iron-air performance goals. A vehicle analysis using the iron-air system as the power propulsion source was completed for a variety of vehicles with range and power variables. Results are presented and discussed. DOE

N84-10483# California Univ., Livermore. Lawrence Livermore Lab.
THE MSAD ACTUATOR SCLENOID, PERFORMANCE EVALUATION AND MODIFICATION
G. Worth 19 Apr. 1983 24 p refs
(Contract W-7405-eng-48)
(DE83-011216; UCID-19784) Avail: NTIS HC A02/MF A01

A small conical-faced solenoid actuator is tested in order to develop design criteria for improved performance including increased pull sensitivity. In addition to increased pull for the normal electrical inputs, a reduction in pull response to short duration electrical noise pulses is also required. Along with dynamic testing of the solenoid, a linear circuit model is developed. This model permits calculation of the dynamic forces and currents which can be expected with various electrical inputs. The model parameters are related to the actual solenoid and allow the effects of winding density and shading rings to be evaluated. DOE

N84-10484# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
DYNAMIC MODEL FOR AN INDUCTION MOTOR AND ITS VERIFICATION
Y. H. Wang Feb. 1983 148 p refs
(Contract W-7405-eng-26)
(DE83-013738; ORNL/Sub-79-7685/1) Avail: NTIS HC A07/MF A01

A dynamic model of an induction motor in the laboratory environment was verified. A computer was used to generate control signals to change the load torque to the induction motor, and to collect the transient data from the motor in response to load torque changes. The dynamic model of the induction motor chosen for the experiment was a well known fifth order nonlinear differential model. A derivation of it was presented. The extended Kalman filter was used to estimate the model parameters. The measured data were compared with those predicted by the fifth order model. It was found that the data predicted by the model agreed well with the experimental data. DOE

N84-10485# California Univ., Livermore. Lawrence Livermore Lab.
SUBNANOSECOND-RISE-TIME, LOW-IMPEDANCE PULSE GENERATOR
R. Druce and G. Vigtlin 3 Jun. 1983 4 p refs Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract W-7405-eng-48)
(DE83-013793; UCRL-88665; CONF-830621-24) Avail: NTIS HC A02/MF A01

A fast rise, low impedance pulse generator developed at the Lawrence Livermore National Laboratory is described. The design specifications of this generator are: 50-kV operating voltage, 1-ohm output impedance, subnanosecond rise time, and a 2 to 10 nanosecond pulse length. High repetition rate is not required. The design chosen is a parallel plate, folded Blumlein generator. A tack switch is utilized for its simple construction and high performance. The primary diagnostic is a capacitive voltage divider with a B probe used to measure the current waveform. DOE

N84-10486# Department of Energy, Washington, D. C. Office of Basic Energy.
REPORT OF THE RESEARCH ASSISTANCE TASK FORCE ON BETA-ALUMINA FOR SODIUM-SULFUR BATTERIES
Jun. 1983 20 p Presented at the Beta-Alummina for Sodium-Sulfur Batteries Meeting, Oak Ridge, Tenn., 8-10 Mar. 1983
(DE83-013616; DOE/ER-0168; CONF-830370-Summ) Avail: NTIS HC A02/MF A01

The meeting reported was structured to concentrate on the fundamental properties of various beta-aluminas and the processing of these materials to form an electrolyte so that critical issues relating to improved performance, lifetime, and reducing costs could be identified. The discussions concentrated on beta form of sodium aluminate materials as the material of choice for use in sodium-sulfur batteries. The meeting focussed on fundamental aspects, defects and degradation, processing and sintering, and battery systems. DOE

N84-10487# Sandia Labs., Albuquerque, N. Mex.
CORRELATION OF ELECTRICAL CONDUCTIVITY AND THERMAL DECOMPOSITION OF PHENOLIC MATERIALS
R. T. Johnson and B. M. Biefeld 1983 7 p refs Presented at the Symp. on Phenolics Revisited, Washington, D.C., 28 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-009186; SAND-83-0595C; CONF-830809-1) Avail: NTIS HC A02/MF A01

Changes in the temperature dependence of the electrical conductivity associated with thermal decomposition of several phenolic materials have been measured to 6000 C in nitrogen and air environments. The materials were phenolic resins reinforced with chopped glass fabric. Thermal decomposition product data and mass loss data were obtained from mass spectroscopy and thermal gravimetric analysis. Results showed that peaks in the conductivity temperature dependence were associated with material decomposition and/or outgassing, and that the presence of oxygen accelerates decomposition above approx. 4500 C. In the region of ohmic conduction (electric fields less than or equal to 4 x 10 to the 3rd power V/cm), there was excellent correlation between thermal decomposition characteristics and the temperature dependent electrical properties. This correlation suggests that electrical conductivity can be used as a thermal analysis tool in characterizing phenolic materials. DOE

N84-10488# Korean Inst. of Science and Technology, Seoul.
NEW FABRICATION PROCESS FOR A TUBULAR LiAl/FeS CELL BATTERY
Y. W. Park and H. Shimotake 1983 5 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug. 1983 Prepared in cooperation with ANL
(Contract W-31-109-eng-38)
(DE83-014305; CONF-830812-35) Avail: NTIS HC A02/MF A01

The LiAl/FeS cell batteries currently under development at the Korea Advanced Institute of Science and Technology (KAIST), Seoul, Korea, are unique in that the cell design is cylindrical with the central LiAl negative electrode and surrounding annual FeS positive electrode, isolated with a MgO powder separator containing LiCl-KCl electrolyte. The design of the cells requires less number of components than those of the prismatic design, thus making it simple to assemble. It has been recognized, however, that the P/E ratio of a cylindrical cell in general tends to be lower than that of a prismatic cell for a given cell capacity because of relatively heavy thickness of both anode and cathode. To achieve a high P/E ratio, electrode area must be extended while reducing the electrode thickness. The formation of the reduced electrode thickness, particularly that of the positive is difficult by the common pressing technique. Therefore, new process was developed to form a layer of the positive mixture containing FeS and electrolyte as thin as 1 mm, thus greatly improving the P/E ratio of the cells. DOE

N84-10489# Sandia Labs., Albuquerque, N. Mex. Passive Components Div.
INSULATION-RESISTANCE MEASUREMENTS OF COATED AND UNCOATED PRINTED WIRING BOARDS

Charles W. Jennings Jun. 1983 36 p refs
(Contract DE-AC04-76DP-00789)
(DE83-015457; SAND-83-0414) Avail: NTIS HC A03/MF A01

Insulation resistance (IR) was measured between narrow spaced conductors on different types of printed circuit boards with and without polymer coatings. Measurement environments consisted of thermal cycling in a humid environment per MIL-STD-202/106, and room temperature with 5 to 100 percent relative humidity (R.H.). The variability of the IR of test patterns both within a board and between boards with the same coating, and the lack of consistent resistivity values, suggest that the measured IR in these environments is not inherent to the materials, but is related to the contaminates present on and in the materials. There was little difference in IR for different conformal coatings or laminate types or sources. Although the IR was found to increase significantly when a board was conformally coated, there was no coating type tested which could ensure a high IR. Porcelain enamel and multiwire boards had lowers IR than conventional circuit boards. An association was observed between low IR and the tendency for dendritic filament formation between conductors in a 100 percent R.H. environment. DOE

N84-10490# California Univ., Livermore. Lawrence Livermore Lab.
SMALL AND LIGHT THYRATRON GRID DRIVER
Randall I. Ross 1 Jul. 1983 6 p Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex., 6-8 Jun. 1983
(Contract W-7405-eng-48)
(DE83-014941; UCRL-88639; CONF-830621-39) Avail: NTIS HC A02/MF A01

Thyratrons are typically used to provide pulsed energy to lasers. A design is reported based on a line type pulser but making use of a high voltage switching power supply to provide a reliable, compact, fault tolerant unit. This pulser is referred to as the thyratron grid driver. During pulser operation the switching power supply cannot keep the pulser thyratron in conduction after the pulse forming network has been discharged, thus eliminating latch up problems. DOE

N84-10491# California Univ., Livermore. Lawrence Livermore Lab.
GATE ARRAY LAYOUT USING CADDS 2
M. D. Pocha, F. D. Cook, and J. W. Balch Jun. 1983 15 p Presented at the 5th Ann. Intern. Computervision User Conf., Miami Beach, Fla., 13-16 Sep. 1983
(Contract W-7405-eng-48)
(DE83-014840; UCRL-89067; CONF-8309111-1) Avail: NTIS HC A02/MF A01

Enhancements made to CADDS 2 using defined commands and ICPL programs to aid in the manual layout and checking of gate array designs are described. A special menu for gate array layout which allows users access to these enhanced capabilities were established. Some of these enhanced capabilities include automatic round off of metal lines to valid routing channels, automatic placement of I/O cells, and rudimentary schematic extraction. These enhancements have made more than a factor of five improvement in our productivity. DOE

N84-10492# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Lab.
ANODIC FILMS
Rolf H. Muller Aug. 1983 10 p refs Presented at the Meeting of the Am. Inst. of Chem. Engr., Denver, 28-31 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE83-016603; LBL-16511; CONF-830859-4) Avail: NTIS HC A02/MF A01

Surface layers are formed on many metals by anodic reaction. Such layers include the products of charge and discharge in many storage batteries, dielectric films used in electronic and optical circuits and display devices, layers responsible for passivity and corrosion protection, and films generated in metal shaping and finishing operations such as anodization, coloring, electropolishing, electrochemical, machining and deburring. Anodic films are formed by solid-solid transformations or by dissolution precipitation processes. Film properties and mechanisms of formation are determined in situ by a number of optical techniques which have recently become available. DOE

N84-10493# Aerospace Corp., Washington, D. C.
ELECTROCHEMICAL-STORAGE-SYSTEMS PROGRAM SUMMARY
Quon Kwan Dec. 1982 308 p refs Presented at the 5th DOE Battery and Electrochem. Contr. Conf., Crystal City, Va., 7 Dec. 1982
(Contract DE-AI01-79ET-25204)
(DE83-011254; CONF-821211-Suppl) Avail: NTIS HC A14/MF A01

A brief description of each contract and subcontract that was a part of the Electrochemical Energy Storage System (ECS) program through FY 1982 is provided. The work described covers electrochemical systems research, supporting research, electrochemical processes, and fuel cells for transportation, aqueous nonflow batteries, nonaqueous batteries, and battery testing. DOE

N84-10494# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
SELECTED ASPECTS OF RADIO INTERFERENCE FROM HVDC (HIGH VOLTAGE DIRECT CURRENT) CONVERTER STATIONS Technical Report, Jun. 1980 - Dec. 1982
R. V. Devore, R. Caldecott, J. L. He, P. D. McWane, and S. A. Sebo Feb. 1982 248 p refs Sponsored in part by Electric Power Research Inst.
(PB83-219675) Avail: NTIS HC A11/MF A01 CSCL 09C

It was necessary to undertake a number of important but quite detailed tasks in order to complete a study of the radio interference from high voltage direct current (HVDC) converter stations. The design and construction of a scale model of a converter pole for the prediction of radio interference was stressed. Many of the results published in the literature and in the final report (EPRI RP 1769-1) are based on the following five separate papers which treat their topics rather comprehensively. A. RF impedances of HVDC Converter Station Equipment; B. Effects of Probe Images on Field Measurements; C. Lumped Circuit Representation of a Converter Pole; D. Analysis of Measured Converter Station Equipment Impedances and Their Synthesis; E. RF Spectral Measurements at Dickinson (MN) Converter Station. GRA

N84-10056*# Sundstrand Corp., Rockford, Ill.
THE 400-Hz AIRCRAFT POWER-GENERATION SYSTEMS: ADVANCING THE BASELINE
Timothy Glennon *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 1-12 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

N84-10057*# Naval Air Development Center, Warminster, Pa.
HIGH-VOLTAGE (270 V) dc POWER-GENERATING SYSTEM FOR FIGHTER AIRCRAFT
Kevin M. McGinley *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 13-25 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

N84-10058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THREE-PHASE, HIGH-VOLTAGE, HIGH-FREQUENCY DISTRIBUTED BUS SYSTEM FOR ADVANCED AIRCRAFT
Robert C. Finke *In its* Aircraft Elect. Secondary Power Jun. 1983 p 27-35 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

N84-10064*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERCALATED GRAPHITE ELECTRICAL CONDUCTORS
Bruce A. Banks *In its* Aircraft Elect. Secondary Power Jun. 1983 p 103-122 refs (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

N84-10065*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW DEVELOPMENTS IN POWER SEMICONDUCTORS
Gale R. Sundberg *In its* Aircraft Elect. Secondary Power Jun. 1983 p 123-141 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

N84-10066*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIGHTWEIGHT, HIGH-FREQUENCY TRANSFORMERS
Gene E. Schwarze *In its* Aircraft Elect. Secondary Power Jun. 1983 p 143-147 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

N84-10067*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-CURRENT, HIGH-FREQUENCY CAPACITORS
David D. Renz *In its* Aircraft Elect. Secondary Power Jun. 1983 p 149-158 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09A

N84-10068*# Westinghouse Electric Corp., Lima, Ohio.
DC-LINK APPROACH TO CONSTANT-FREQUENCY AIRCRAFT POWER
Daniel S. Yorksi *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 159-172 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

N84-10069*# General Electric Co., Binghamton, N.Y.
CYCLOCONVERTER ON THE ALL-ELECTRIC AIRPLANE
Robert C. Webb *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 173-188 (For primary document see N84-10055 01-07)
Avail: NTIS HC A09/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-10495 Pittsburgh Univ., Pa.
STABILITY OF ROTATING DISK FLOWS Ph.D. Thesis
Alvard Giron-Duarte 1982 180 p
Avail: Univ. Microfilms Order No. DA8305576

A general model is developed to study the stability characteristics of flows due to rotating disks. The proposed model provides results which are in better agreement with the experimental data of Kobayashi than the results obtained with Brown's or Kobayashi's model. The problem of stability of flows between finite parallel disks is investigated in two cases: (1) one disk rotating and the other stationary, and (2) counter-rotating disks. Theoretical calculations are in fair agreement with the experimental results for the first case. For the second case, some discrepancy exists between the theoretical and experimental results. Therefore, further research is recommended. Dissert. Abstr.

N84-10496 New Mexico Univ., Albuquerque.
ANALYSIS OF A SOLAR HEAT PIPE HEATING AND ABSORPTION COOLING SYSTEM Ph.D. Thesis
Satish Raghunath Munje 1982 148 p
Avail: Univ. Microfilms Order No. DA8304352

A new concept which combines a flat-plate heat-pipe solar collector for daytime solar water heating by evaporation of a refrigerant and night-time water chilling by absorption refrigeration was analyzed. A comprehensive survey of literature was completed to establish the existing state of knowledge on intermittent absorption refrigeration, flat-plate solar heat collectors and night sky radiation cooling. The literature survey showed that the idea of using a passive device such as a heat pipe with the absorption refrigeration principle for both heating and cooling is relatively new. A mathematical model for the heat-pipe flat-plate collector and the absorption refrigeration process was developed. A cost-effectiveness study was also carried out to find the optimum thickness of the collector plate. The optimum plate thickness was used in the parametric study of the system. Dissert. Abstr.

N84-10497 Illinois Univ., Chicago.
AN EXPERIMENTAL STUDY OF HEAT AND MOMENTUM TRANSFER IN PIPE FLOW OF VISCOELASTIC FLUIDS Ph.D. Thesis
Kong Sang Ng 1982 231 p
Avail: Univ. Microfilms Order No. DA8304240

Heat transfer and pressure drop results are presented for pipe flow of aqueous solutions of polyacrylamide and polyethylene oxide in weight concentration of a few thousand parts per million. Experiments were conducted in two experimental set-ups. The first set-up consisted of two different diameter tubes. The turbulent flow hydrodynamic entry length was found to be 110 pipe diameters. Laminar friction factor data were in good agreement with correlations for purely viscous non-Newtonian fluids. The second set-up consisted of three different diameter tubes with heat transfer length-to-diameter ratio of 282, 489, and 648. The turbulent flow thermal entry length was found to be about 400 pipe diameters. The asymptotic dimensionless heat transfer coefficients were observed to be independent of pipe diameter, polymer molecular weight, and polymer concentration, suggesting the existence of a maximum heat transfer reduction asymptote.
Dissert. Abstr.

N84-10498*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL DOCUMENTATION OF TRAILING-EDGE FLOWS AT HIGH REYNOLDS NUMBER
P. R. Viswanath (Stanford Univ.), J. W. Cleary, and H. L. Seegmiller Aug. 1983 48 p refs
(NASA-TM-84375; A-9376; NAS 1.15:84375) Avail: NTIS HC A03/MF A01 CSCL 20D

Experiments documenting attached trailing-edge and near-wake flows at high Reynolds numbers are described. A long, airfoil-like model was tested at subsonic and low transonic Mach numbers, and both symmetrical and asymmetrical flows with pressure gradients upstream of the trailing edge were investigated. Model surface pressures and detailed mmean and turbulence flow qualities were measured in the vicinity of the trailing edge and in the near-wake. The data obtained are of sufficient quality and detail to be useful as test cases in assessing turbulence models and calculation methods. M.G.

N84-10499*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE STABILITY OF THE UNSTEADY BOUNDARY LAYER ON A CYLINDER OSCILLATING TRANSVERSELY IN A VISCOUS FLUID Final Report
Philip Hall Aug. 1983 45 p refs
(Contract NAS1-17070)
(NASA-CR-172216; ICASE-83-45; NAS 1.26:172216) Avail: NTIS HC A023/MF A01 CSCL 20D

The stability of the two-dimensional flow induced by the tranverse oscillation of a cylinder in a viscous fluid is investigated in both the linear and weakly nonlinear regime. The major assumption that is made to simplify the problem is that the oscillation frequency is large in which case an unsteady boundary layer is set up on the cylinder. Results are given for cylinders of elliptic cross section and it is found that for any given eccentricity the most dangerous configuration is when the cylinder oscillates parallel to its minor axis. Some discussion of nonlinear effects is also given and for the circular cylinder it is shown that the steady streaming boundary layer of the basic flow is significantly altered by the instability. Author

N84-10500# British Gas Corp., London (England).
SYMPOSIUM ON HEAT PUMPS PER DIN 8900
R. Brinke, B. Schrempf, and P. Boehm 13 Jul. 1983 19 p Symp. held in Munich, Spring, 1981
(BLL-Trans-T5843/BG-MRS1796-82) Avail: British Library Lending Div., Boston Spa, Engl.

Since heat pumps are designed and manufactured in the form of automatic operating equpment the various ergonomic assessment criteria in respect of dimensions, posture, forces and movement of the human body can be ignored. There remains however the requirement for assessing indications (readings) and signals for their usefulness and unambiguousness (clearness) and the need for assessing the various operating elements required. The main stress in considerations suitability will be put on assessing the design in respect of the direct or indirect hazards to which people are exposed when they are in the place of installation of a heat pump, and/or touch and operate heat pumps including the effects of incorrect operation. In this context it is necessary to bear in mind the need for any satisfactory safety level which may have been established to remain unimpaired for the full service life of the heat pump concerned. Author

N84-10501*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EVOLUTION EQUATIONS FOR TAYLOR VORTICES IN THE SMALL GAP LIMIT Final Report
Philip Hall Oct. 1983 17 p refs
(Contract NAS1-17070)
(NASA-CR-172249; NAS 1.26:172240; Rept-83-55) Avail: NTIS HC A02/MF A01 CSCL 20D

The centrifugal instability of the viscous fluid flow between concentric circular cylinders in the small gap limit is considered. The amplitude of the Taylor vortex is allowed to depend on a slow time variable, a slow axial variable, and the polar angle. It is shown that the amplitude of the vortex cannot in general be described by a single amplitude equation. However, if the axial variations are periodic a single amplitude equation can be derived. In the absence of any slow axial variations it is shown that a Taylor vortex remains stable to wavy vortex perturbations. Furthermore, in this situation, stable nonaxisymmetric modes can occur but do not bifurcate from the Taylor vortex state. The stability of these modes is shown to be governed by a modified form of the Eckhaus criterion. Author

N84-10502# Toronto Univ., Downsview (Ontario).
RANDOM-CHOICE SOLUTIONS FOR WEAK SPHERICAL SHOCK-WAVE TRANSITIONS OF N-WAVES IN AIR WITH VIBRATIONAL EXCITATION
H. Honma and I. I. Glass Jul. 1983 112 p refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada, the Japan Society for the Promotion of Science, and the Scientific Research Aid of the Ministry of Education of Japan
(Grant AF-AFOSR-0097-82)
(UTIAS-253; ISSN-0082-5255) Avail: NTIS HC A06/MF A01

In order to clarify the effects of vibrational excitation on shock wave transitions of weak, spherical N-waves, which were generated by using sparks and explodng wires as sources, the compressible Navier-Stokes equations were slved numerically, including a one mode vibrational relaxation equation. A small pressurized air sphere explosion was used to simulate the N-waves generated from the actual sources. By employing the random choice method (RCM) with an operator-splitting technique, the effects of artificial viscosity appearing in finite difference schemes were eliminated and accurate profles of the shock transitions were obtained. However, a slight randmness in the variation of the shock thickness remains. It is shown that a computer simulation is possible by using a proper coice of initial parameters to obtain the variations of the N-wave overpressure and half-duration with distance from the source. The calculated rise times are also shown to simulate both spark and exploding wire data. It was found that, in addition to the vibrational relaxation time of oxygen, both the duration and the attenuation rate of a spherical N-wave are important factors controlling its rise time. Author

N84-10503# British Gas Corp., London (England).
A SIMPLE MATHEMATICAL MODEL FOR HEAT TRANSFER AND ITS APPLICATION FOR CONTINUOUS TYPE REHEATING FURNACES
R. Klima (Betriebsforschungsinstitut, Duesseldorf, West Germany), A. Kuck (Betriebsforschungsinstitut, Duesseldorf, West Germany), and D. Sucke (Betriebsforschungsinstitut, Duesseldorf, West Germany) 19 Jul. 1983 18 p refs Transl. into ENGLISH from Gas Waerme Intern. (Netherlands), v. 32, no. 4, Apr. 1983 p 138-143 Presented at the 15th Meeting of the Oil Panel, 13th Meeting, 14th Meeting of the Heat Transfer Panel, and the 29th Meeting of the Aerodyamic Panel, Velsen, Netherlands, 27-29 Oct. 1981
Avail: NTIS HC A02/MF A01

The requirements that must be met by mathematical models for the process control of continuous-type reheating furnaces are outlined. A description is given of heat transfer in reheating furnaces is computed using simple models. A comparison of computed figures with measured values shows the accuracy of description attainable with such models for stationary and non-stationary operation. The mathematical models are fully equal to their task of replacing measuring points in the proess control of reheating furnaces in on-line operation. Since similar conceptual models were applied for the forecasting models designed to determine energetically optimum control parameters for the future, a high degree of accuracy of description is also expected for these elements. Commercial-scale testing and use of the complete program system for the process control of continuous-type reheating furnaces in on-line operation is under way. Author

N84-10504*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRESSURE AND HEATING-RATE DISTRIBUTIONS ON A CORRUGATED SURFACE IN A SUPERSONIC TURBULENT BOUNDARY LAYER
James Wayne Sawyer Nov. 1977 84 p refs
(NASA-TP-1024; L-11732; NAS 1.60:1024) Avail: NTIS HC A05/MF A01 CSCL 20D

Drag and heating rates on wavy surfaces typical of current corrugated plate designs for thermal protection systems were determined experimentally. Pressure-distribution, heating-rate, and oil-flow tests were conducted in the Langley Unitary Plan wind tunnel at Mach numbers of 2.4 and 4.5 with the corrugated surface exposed to both thick and thin turbulent boundary layers. Tests were conducted with the corrugations at cross-flow angles from 0 deg to 90 deg to the flow. Results show that for cross-flow angles of 30 deg or less, the pressure drag coefficients are less than the local flat-plate skin-friction coefficients and are not significantly affected by Mach number, Reynolds number, or boundary-layer thickness over the ranges investigated. For cross-flow angles greater than 30 deg, the drag coefficients increase significantly with cross-flow angle and moderately with Reynolds number. Increasing the Mach number causes a significant reduction in the pressure drag. The average and peak heating penalties due to the corrugated surface are small for cross-flow angles of 10 deg or less but are significantly higher for the larger cross-flow angles. Author

N84-10505# Ballistic Research Labs., Aberdeen Proving Ground, Md.
OSCILLATIONS OF A LIQUID IN A ROTATING CYLINDER. PART 2: SPIN-UP Final Report
Raymond Sedney and Nathan Gerber May 1983 59 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A129094; AD-F300254; ARBRL-TR-02489) Avail: NTIS HC A04/MF A01 CSCL 19/1

The unsteady motion of a fluid which fills a cylindrical container in a spinning projectile is considered. The spin is imparted impulsively to the cylinder and spin-up of the fluid is the basic flow which is perturbed to study the waves in the rotating fluid. The core flow is perturbed, not the Ekman layer flow. This is called the spin-up eigenvalue problem which is solved with modal solutions. Viscous perturbations are needed because of the

boundary layer and critical layer. A numerical method of solution is given and several results shown. There are two times at which projectile instability might occur. The results of the theory and method are validated by comparison with experimental results.
GRA

N84-10506# Wisconsin Univ., Madison. Mathematics Research Center.
NONEXISTENCE OF A SHOCK LAYER IN GAS DYNAMICS WITH A NONCONVEX EQUATION OF STATE
Robert L. Pego Apr. 1983 26 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A129169; MRC-TSR-2505) Avail: NTIS HC A03/MF A01 CSCL 12/1

A classical result of Gilbarg states that a simple shock wave solution of Euler's equations in compressive if and only if a corresponding shock layer solution of the Navier-Stokes equations exists, assuming, among other things, that the equation of state is convex. An entropy condition appropriate for weeding out unphysical shocks in the nonconvex case has been introduced by Liu. For shocks satisfying his entropy condition, Liu showed that purely viscous shock layers exist (with zero heat conduction). Dropping the convexity assumption, but retaining many other reasonable restrictions on the equation of state, Pego, the author constructs an example of a (large amplitude) shock which satisfies Liu's entropy condition but for which a shock layer does not exist if heat conduction dominates viscosity. Pego also gives a simple restriction, weaker than convexity, which does guarantee that shocks which satisfy Liu's entropy condition always admit shock layers.
Author (GRA)

N84-10507# Dayton Univ., Ohio. Research Inst.
NUMERICAL SIMULATION OF FLOW AROUND A THREE-DIMENSIONAL TURRET Final Report
S. C. Purohit (Indian Space Research Organisation) Wright-Patterson AFB, Ohio AFWAL Nov. 1982 63 p refs
(Contract F33615-79-C-3030; AF Proj. 2307)
(AD-A128686; AFWAL-TR-82-3075; UDR-TR-82-73) Avail: NTIS HC A04/MF A01 CSCL 12/1

The compressible Navier-Stokes equations in mass averaged variables are numerically solved for flow around a surface mounted turret. The three-dimensional unsteady separated flow is investigated with emphasis on the near wake region. The computation is performed on the CRAY-1 computer using MacCormack's explicit finite difference scheme. For the free stream Mach number 0.55 and Reynolds number 10.3 x 1,000,000/m, the time dependent calculation is carried out for 55,800 grid points in the computational domain to achieve steady state periodic solution. The entire flow field around the turret is analyzed and the comparison with available experimental data is reported.
Author (GRA)

N84-10508# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.
COMPUTER PROGRAM FOR PERFORMANCE AND SIZING ANALYSIS OF COMPACT COUNTER-FLOW PLATE-FIN HEAT EXCHANGERS, RESEARCH AND DEVELOPMENT REPORT
Jon C. Ness Dec. 1982 63 p refs
(AD-A129856; DTNSRDC/PAS-82-41; DOD/DR-83-005A) Avail: NTIS HC A04/MF A01 CSCL 13/1

This report presents a computer program for preliminary design analysis of counter-flow, compact, plate-fin heat exchangers. The program method is based on the effectiveness-NTU relationship analysis. The heat exchanger design begins with assumptions for counter-flow length, total frontal flow area and core matrix fin geometry. Using these constraints, the program proceeds to calculate the resulting effectiveness and pressure drop based on specified air-side and gas-side fin types; the pressures, temperatures, and mass flows of the air and gas streams; fuel-air ratio; as well as, the maximum air-side inlet header velocity. Heat exchanger designs may be generated based on four different fin types (i.e., plain, louvered, strip/offset or wavy fins) over a varied number of core dimensions. Program output includes inlet and exit conditions on air and gas sides, effectiveness, fin characteristics, core length and volume, total frontal units, overall weight, and air-side header diameters and velocities. This report presents the analysis method, description of input and output with sample cases, and a program listing.
GRA

N84-10509# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
COMPUTATION OF THREE-DIMENSIONAL FLOWS IN DUCTS OF VARYING CROSS SECTIONS Summary Progress Report, 15 Jun. 1981 - 15 Jan. 1983
Suhas V. Patankar May 1983 72 p refs
(Contract N00014-81-K-0555; NR Proj. 097-452)
(AD-A130194; SR-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

A calculation procedure is developed for the three-dimensional flow in ducts of varying cross section. The procedure is of the fully parabolic variety; i.e., the solution for the whole duct is obtained by a marching scheme that proceeds from the upstream end to the downstream region solving the flow over one cross section at each marching step. The procedure for each cross section is based on the finite element method of Baliga and Patankar. The report describes a major improvement incorporated in the method and some examples of the use of the method. The adaptation of the method for a marching procedure for duct flows is also described. Among the examples presented as test problems are the developing flows: in a square duct, over a rod bundle, in a square diffuser, and in an elliptic duct of varying cross-sectional shape. All numerical solutions are shown to be in satisfactory agreement with exact solutions and/or other available solutions and experimental data.
Author (GRA)

N84-10510# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A FIELD OF PRESSURES OF SHOCK WAVES DURING A POWERFUL UNDERWATER DISCHARGE
G. S. Bondarenko 10 Jun. 1983 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Elektromekhan. (USSR), no. 5, May 1968 p 503-507
(AD-A130084; FTD-ID(RS)T-0578-83) Avail: NTIS HC A02/MF A01 CSCL 20/4

The pressure appearing during an underwater electrical discharge was measured. The dependence of the pressure at the front of the shoch wave on the radial and angular coordinates are investigated using the simultaneous recording of the current and voltage. The electroacoustic efficiency of the discharge was also measured. The pulse voltage generator and the equipment used for measuring the pressure of the electrical characteristics are described. The measuring equipment was supplementd by a compensator of inductive shift of the current and voltage phases. Resistors of the VS type were used in the high voltage arm of the divider.
GRA

N84-10511# Pennsylvania State Univ., University Park. Applied Research Lab.
AN INVESTIGATION OF CAVITY CYCLING FOR VENTILATED AND NATURAL CAVITIES
D. R. Stinebring, M. I. Billet, and J. W. Holl 7 Feb. 1983 29 p refs
(Contract N00024-79-C-6043)
(AD-A130641; ARL/PSU/TM-83-13) Avail: NTIS HC A03/MF A01 CSCL 20/4

The frequency of cavity cycling due to the re-entrant jet was measured for a 45 degrees conical-nosed model having a 1-inch diameter afterbody. Spectral analyses of the output of an internally mounted transducer were performed to determine the cycling frequency. The cavity cycling was also measured from high-speed movies taken of the model cavitation. Data for both natural (vaporous) and ventilated cavities were obtained and compared with data from hydroballistics tank tests of NSWC and previous water tunnel tests. The cavity cycling frequency presented as a Strouhal number increases with cavitation number. Frequency data, measured by the transducer, for vaporous cavitation were higher than the results for similar ventilated cavities. However,

measurements from high-speed movies show close agreement between cycling frequency for both types of cavitation.
Author (GRA)

N84-10512# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLOW-FIELD MATRIX SOLUTION FOR DIRECT PROBLEM OF FLOW ALONG S1 RELATIVE STREAM SURFACE EMPLOYING NON-ORTHOGONAL CURVILINEAR COORDINATES AND CORRESPONDING NON-ORTHOGONAL VELOCITY COMPONENTS
Wu Wenguau and Liu Cuie 18 Jul. 1983 133 p refs Transl. into ENGLISH from Gongcheng Rewuli Xuebao (China), v. 1, no. 1, Feb. 1980 p 17-79, 95-102
(AD-A131031; FTD-ID(RS)T-1010-82) Avail: NTIS HC A07/MF A01 CSCL 20/4

Based on three dimensional flow thermoaerodynamic equations of turbine macinery, employing nonorthogonal curvilinear cordinates and their corresponding nonorthogonal velocity components, the main function to be solved i.e., the second order quasilinear partial differential equation o the stream function was obtained by introducing a stream function. Two measures were adopted, (1) non-zero elemens were numbered according to the diagonal line, and (2) fictitious points were added, to greatly reduce the internal storage of the computer. This program was used in the calculation of the blade pattern of compressors and turbines.
Author

N84-10513# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
HEAT CHECKING IN THE CONTACT ZONE OF A FACE SEAL: A THREE-DIMENSIONAL MODEL OF A SINGLE MOVING ASPERITY Annual Report
Frederick D. Ju and John H. Huang Apr. 1983 68 p refs
(Contract N00014-76-C-0071)
(AD-A130756; ME-121(83)ONR-414-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

Heat checking phenomenon in mechanical seals resulting from the passages of a single asperity over the face of a seal ring has been solved with a thermomechanical model of a semi-infinite medium subjected to the frictional heat source over the moving contact zone. An earlier analysis of such a problem was based upon a two-dimensional model of a single moving asperity. Such a load resulted in fracture which is initiated beneath the surface at the trailing edge of the moving load. For a better description of the physical problem, a three-dimensional model is examined in the present study. A single moving asperity, with a circular or a rectangular geometry of the contact area, is assumed on the mating part of the seal face. The general solution is obtained for any distribution of contact loads. Numerical solutions are obtained for uniform and parabolic distributions of pressure over the circular and rectangular contact zones. The traverse speed of the friction load is considered the same as the rubbing speed for the current problem. The roles of material properties and operating variables are delineated in terms of dimensionless parameters. The analytical solutions of the mechanical and the thermal stress fields are solved by means of the double Fourier transforms. The temperature field is obtained by the use of the Green's functions. Numerical results of the corresponding integral solutions are represented in graphs.
Author (GRA)

N84-10514# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
FLUID DYNAMIC MECHANISMS AND INTERACTIONS WITHIN SEPARATED FLOWS AND THEIR EFFECTS ON MISSILE AERODYNAMICS Final Technical Report, 1979 - 1983
A. L. Addy, W. L. Chow, H. H. Korst, and R. A. White May 1983 382 p refs
(Contract DAAG29-79-C-0184)
(AD-A130831; UILU-ENG-83-4005) Avail: NTIS HC A17/MF A01 CSCL 20/4

Significant data and detailed results of a joint research effort investigating the fluid dynamic mechanisms and interactions within separated flows are presented. The results were obtained through analytical, experimental, and computational investigations of base flow related configurations. The research objectives focus on understanding the component mechanisms and interactions which establish and maintain separated flow regions. Flow models and theoretical analyses were developed to describe the base flowfield. The research approach has been to conduct extensive small-scale experiments on base flow configurations and to analyze these flows by component models and finite-difference techniques. The modeling of base flows of missiles (both powered and unpowered) for transonic and supersonic freestreams has been successful by component models. Research on plume effects and plume modeling indicated the need to match initial plume slope and plume surface curvature for valid wind tunnel simulation of an actual rocket plume. The assembly and development of a state-of-the-art laser Doppler velocimeter (LDV) system for experiments with two-dimensional small-scale models has been completed and detailed velocity and turbulence measurements are underway. The LDV experiments include the entire range of base flowfield mechanisms - shear layer development, recompression/reattachment, shock-induced separation, and plume-induced separation.
GRA

N84-10515# Naval Ship Research and Development Center, Bethesda, Md.
OPTIMUM FOREBODY SHAPING FOR AXISYMMETRIC SUBMERSIBLES WITH TURBULENT BOUNDARY LAYERS AND BLC (BOUNDARY LAYER CONTROL) AFTERBODIES Final Report, Oct. 1981 - Jan. 1983
Benjamin J. Neumann Jul. 1983 42 p refs
(AD-A130950; DTNSRDC/AERO-1284; DTNSRDC-83/055) Avail: NTIS HC A03/MF A01 CSCL 13/10

One objective of the Advanced Undersea Vehicle (AUV) program is to design a low drag vehicle. The approach in this investigation is boundary layer control by means of an annular suction slot located on the afterbody. Although wind tunnel data showed significant reduction in propulsive power over conventional shapes, an attempt was made to achieve further reduction by means of forebody shaping. Two methods were used to vary the geometric parameters for this analysis. The direct method, based on the mathematical development of the Series 58 bodies, allows the definition of a shape by a fifth-order polynomial based on the four fundamental parameters of fineness ratio, nose radius of curvature, location of maximum thickness, and prismatic coefficient. The inverse method allows various velocity distributions to define the body shape. The shapes derived by this method have flat velocity distributions and show similar trends to the polynomial shapes (about 3-percent reduction in propulsive power). The range of fineness ratios analyzed was from 1 to 10 at a volume-based Reynolds number of 3.2 million. In the range of 2.5 to 8, fineness ratio did not affect propulsive power more than 6 percent. A maximum improvement of 3 percent as shown by varying the meridian section.
GRA

N84-10516# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
NAVIER-STOKES COMPUTATIONAL STUDY OF THE INFLUENCE OF SHELL GEOMETRY ON THE MAGNUS EFFECT AT SUPERSONIC SPEEDS Final Technical Report
Walter B. Sturek, Donald C. Mylin, Bernard Guidos, and Charles J. Nietubicz Jun. 1983 46 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A130630; ARBRL-TR-02501) Avail: NTIS HC A03/MF A01 CSCL 20/4

Recent papers have reported the application of the thin-layer Parabolized Navier-Stokes (PNS) computational technique to predict the flow over spinning shell at supersonic speeds. This paper reports the results of a computational study using thin layer Navier-Stokes codes to examine the effects of shell nose tip and afterbody geometry. The geometries considered include sharp, hemisphere cap, and flattened nose configurations and a parametric variation of the boattail shape. The results are presented primarily as the aerodynamic coefficients versus Mach number of 1.5 less than M less than 5. The Magnus effect is shown to be

strongly influenced by nose bluntness as well as the geometry of the shell afterbody. Author (GRA)

N84-10517# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex.
AFTERBODY PROPULSOR PERFORMANCE VALIDATION FOR A 2.65 FINENESS RATIO BODY ADVANCED TACTICAL VEHICLE Final Report, May 1981 - May 1982
J. G. Spangler, R. L. Mask, and K. M. Krall Oct. 1982 156 p refs
(Contract N00600-81-C-1334; ARPA Order 4045)
(AD-A131259; ATC-R-91100/2CR-49) Avail: NTIS HC A08/MF A01 CSCL 20/4

This report presents the results from a low-speed wind tunnel test of a unique low-drag fineness-ratio-2.65 vehicle concept employing integrated boundary layer control and propulsion. The concept is based on the efficient energization of the body's boundary layer by blowing as it enters the strong adverse pressure gradient on a full and blunt afterbody. The boundary layer energization is accomplished with a full-circumferential blowing jet, designed to achieve fully-attached afterbody flow while also providing sufficient thrust to achieve self-propulsion with low installed-power. The analytical methodology for analysis and evaluation of the total concept, as well as the individual components, is presented and compared with wind tunnel test data. Analytical prediction accuracy has been completely validated for both turbulent and laminar vehicle configurations. GRA

N84-10518# PAR Enterprises, Inc., Fairfax, Va.
ASSESSMENT OF THE BCL AND ORL CHEMICAL HEAT PUMPS
Wilfred J. Rebello and Dan F. Suciu (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho) 30 Nov. 1982 79 p refs
(Contract DE-AC07-76ID-01570)
(DE83-011450; EGG-CSH-6223) Avail: NTIS HC A05/MF A01

A lithium bromide water absorption heat pump, called the Battelle Temperature Booster (BTB) was developed, modifying an absorption chiller. The BTB demonstration unit was designed to take energy from waste steam at 2350F and produce the equivalent of process steam at 3380F with an output of 2 MM Btu/hr. A LiBr water absorption heat pump to take energy from waste water at 1400F and produce hot water at 1820F with an output of 150,000 Btu/hr was designed. The key design feature of this unit is the adiabatic absorber. DOE

N84-10519# Sandia Labs., Albuquerque, N. Mex.
GROWTH AND DECAY OF ONE-DIMENSIONAL SHOCK WAVES IN CHEMICALLY REACTING MULTIPHASE MIXTURES
Paul A. Taylor Apr. 1983 75 p refs
(Contract DE-AC04-76DP-00789)
(DE83-011134; SAND-83-0730) Avail: NTIS HC A04/MF A01

The behavior of one dimensional shock waves in a chemically reacting, nondiffusing multiphase mixture, one in which the constituents may possess individual microstructure such as porosity and granularity was examined. The shock evolution equation, which determines the local growth or decay of the shock wave in view of the dissipative and enhancive mechanisms involved was introduced. This equation ccounts for the immiscibility and energy exchange between the constituents as associated with the microstructural properties of the mixture, along with the chemical reactivity at the shock front. The constituent Hugoniot properties and associated remarks within the context of a multiphase mixture thecry are presented. DOE

N84-10520# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
GENERALIZED ALGEBRAIC RELATION FOR PREDICTING DEVELOPING CURVED-CHANNEL FLOW WITH A k-EPSILON MODEL OF TURBULENCE
Joseph A. C. Humphrey and Farzad Pourahmadi Nov. 1982 18 p refs Presented at the 3rd Symp. on Turbulent Shear Flow, Davis, Calif., 9-11 Sep. 1981
(Contract DE-AC03-76SF-00098)
(DE83-009946; LBL-12009-REV-2; CONF-810327-1-REV-2) Avail: NTIS HC A02/MF A01

Usng algebraic approximations for the Reynolds stress equations a general expression was derived for C/sub (SIGMA) in nu/sub t/ = C/sub (SIGMA)/k(2)epsilon which accounts simultaneously for the effects of steamline curvature and pressure strain in the flow, including wall induced influences on the velocity fluctuations. The expression derived is shown to encompass similar but more specific formulations proposed by Bradshaw, Rodi, and Leschziner and Rodi. The present formulation was used in conjunction with a k-epsilon model of turbulence of predict developing, two dimensional, curved channel flows were both curvature and pressure strain effects are large. Minor modifications to include the influence of curvature on the length scale of the flow near the walls produce a significant improvement in the calculations. While, in general, predictions are in good agreement with experimental measurements of mildly and strongly curved flows, the model tends of overpredict the kinetic energy of turbulence in the inner-radius (convex) wall region. DOE

N84-10521# California Univ., Livermore. Lawrence Livermore Lab.
MODELED HEATING AND SURFACE EROSION COMPARING MOTILE (GAS BORNE) AND STATIONARY (SURFACE COATING INERT PARTICLE ADDITIVES
Alfred C. Buckingham and Wigbert J. Siekhaus 27 Sep. 1982 11 p refs Presented at the Tri-Service Symp. on Gun Tube Wear and Erosion, Dover, N.J., 25-28 Oct. 1982
(Contract W-7405-eng-48)
(DE83-000597; UCRL-87686; CONF-821043-1) Avail: NTIS HC A02/MF A01

The unsteady, non-similar, chemically reactive, turbulent boundary layer equations are modified for gas plus dispersed solid particle mixtures, for gas phase turbulent combustion reactions and for heterogeneous gas-solid surface erosive reactions. The exterior (ball istic core) edge boundary conditions for the solutions are modified to include dispersed particle influences on core propellant combustion-generated turbulence levels, combustion reactants and products, and reaction-induced, non-isentropic mixture states. The wall surface (in this study it is always steel) is considered either bare or coated with a fixed particle coating which is conceptually nonreactive, insulative, and nonablative. Two families of solutions are compared. These correspond to: (1) consideration of gas-borne, free-slip, almost spontaneously mobile (motile) solid particle additives which influence the turbulent heat transfer at the uncoated steel surface and, in contrast, (2) consideration of particle-free, gas phase turbulent heat transfer to the insulated surface coated by stationary particles. DOE

N84-10522# Lehigh Univ., Bethlehem, Pa. Inst. of Thermo-Fluid Engineering and Science.
RAMAN SCATTERING TEMPERATURE MEASUREMENTS FOR WATER VAPOR IN NONEQUILIBRIUM DISPERSED TWO-PHASE FLOW
C. M. Anastasia, S. Neti, W. R. Smith, and J. C. Chen Sep. 1982 201 p refs
(DE83-900107; NUREG/CR-2905) Avail: NTIS HC A10/MF A01

In several important applictions of dispersed, two-phase flow, the possible occurrence of thermodynamic nonequilibrium between the vapor and liquid phases is of fundamental interest and practical concern. The measurement of jthe potential superheated temperatures of the vapor, in the presence of cold liquid droplets remains a difficult experimental task. To date, only partial success was obtained by use of intrusive, aspirating thermocouple probes. The feasibility of using Raman scattering to measure vapor temperatures in dispersed two phase flow as an alternative nonintrusive technique was investigated. The Raman system developed for this investigation is described, including alignment of optics and optimizaton of the photodetector for photon pulse counting. Author

N84-10523# Flow Research, Inc., Kent, Wash.
FLOW-VISUALIZATION STUDY OF THE MOD-2 WIND-TURBINE WAKE

H. T. Liu, J. W. Waite, T. R. Jiester (FloWind Corp., Kent, Wash.), P. H. Tacheron, and R. A. Srnsky Jun. 1983 143 p refs
(Contract DE-AC06-76RL-01830)
(DE83-014391; PNL-4535) Avail: NTIS HC A07/MF A01

The geometry of the MOD 2 wind turbine wake in terms of wake height and width as a function of downstream distance under two conditions of atmospheric stability was determined. The mean velocity deficit at several downstream stations in the turbine wake was estimated and the behavior of the rotor generated vortices, particularly their configuration and persistence was investigated. The background of the wake problem is briefly examined, and the critical issues that the flow visualization study addresses are included. Experimental techniques and data analysis methods are described. DOE

N84-10524# California Univ., Berkeley. Lawrence Berkeley Lab.
PREDICTION OF EROSIVE WEAR BY SOLID PARTICLES IN A TURBULENT CURVED-CHANNEL FLOW
J. A. C. Humphrey, F. Pourahmadi, and A. Levy May 1983 50 p refs Presented at 7th Mater. for Coal Conversion and Utilization Conf., Gaithersburg, Md., 16 Nov. 1982
(Contract DE-AC03-76SF-00098)
(DE83-012896; LBL-15289; CONF-821145-5) Avail: NTIS HC A03/MF A01

Numerical modeling of fluid-particulate turbulent flow transport processes, including erosion, cannot substitute (at least for the present) good experimentation. Notwithstanding, the calculation approach offers a viable, relatively inexpensive and complementary alternative for gleaming useful information on the relative dependence of particle transport and erosion on the flow system parameters of relevance. In the present study these parameters include: the particle phase response time, Reynolds number and concentration; the turbulent characteristics of the fluid phase; the channel aspect ratio and curvature. This communication summarizes the main results predicted by means of a numerical procedure for the motion of a dilute suspension of solid particles driven by turbulent flow in curved and straight two-dimensional channels. An exposition of the theoretical development, the numerical model, its testing and application to these configurations of special engineering interest are provided. A simple model for erosion is used successfully to predict surface wear. DOE

N84-10525# Argonne National Lab., Ill. Components Technology Div.
DEVELOPMENT OF ENHANCED HEAT TRANSFER/ TRANSPORT/STORAGE SLURRIES FOR THERMAL-SYSTEM IMPROVEMENT
K. E. Kasza and M. M. Chen (Illinois Univ., Urbana-Champaign) 1983 14 p refs Presented at Elec. Power Res. Inst. Workshop on Thermal Storage, Palo Alto, Calif., 17 Jan. 1983
(Contract W-31-109-eng-38)
(DE83-009688; CONF-830142-1) Avail: NTIS HC A02/MF A01

Various fluid mechanics and heat transfer mechanisms responsible for improving thermal system performance are described. A threefold or greter heat transfer enhancement is possible with slurries for certain heat transfer surface geometry. The enhancement potential was postulated to be greatest for phase change slurries in a study of a thermal system. Source-to-sink temperature difference, mass flow, pumping power, and storage volume requirements were significantly reduced using a phase change slurry. A.R.H.

N84-10526# California Univ., Livermore. Lawrence Livermore Lab.
MULTIGRID SEMI-IMPLICIT HYDRODYNAMICS REVISITED
J. E. Dendy 1983 22 p refs Presented at Conf. on Large Scale Sci. Computation, Madison, Wis., 16 May 1983
(Contract W-7405-eng-36)
(DE83-012675; LA-UR-83-1362; CONF-830581-1) Avail: NTIS HC A02/MF A01

The multigrid method has for several years been very successful for simple equations like Laplace's equation on a rectangle. For more complicated situations, however, success has been more elusive. Indeed, there are only a few applications in which the multigrid method is now being successfully used in complicated production codes. The application discussed in this paper was actually attempted several years ago. In that paper the multigrid method was applied to the pressure iteration in three Eulerian and Lagrangian codes. The application to the Eulerian codes, both incompressible and compressible, was successful, but the application to the Lagrangian code was less so. The reason given for this lack of success was that the differencing for the pressure equation in the Langrangian code, SALE, was bad. In this paper, the application of multigrad to the pressure equation in SALE is examined with the goal of succeeding this time without cheating. DOE

N84-10527# Sandia Labs., Albuquerque, N. Mex.
GAS-TRANSFER ANALYSIS. SECTION B: REAL GAS RESULTS VIA THE VANDERWAALS EQUATION OF STATE AND VIRIAL EXTENSION OF ITS LIMITING ABEL-NOBLE FORM
D. R. Chenoweth Jun. 1983 78 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013281; SAND-83-8229) Avail: NTIS HC A05/MF A01

An ideal-gas, quasi-steady, duct-flow model previously formulated for small scale gas-transfer problems is extended to real gases via the van der Waals equation of state as well as general virial expansions. The model is applicable for an arbitrary series of ducting components where each is described empirically by total pressure and total temperature change correlations. The adequacy of the van der Waals model for gas-transfer calculations is verified by comparisons with: (1) real gas PVT data; (2) the magnitudes of the controlling effects; and (3) approximate limiting case solutions with numerical results using more accurate real-gas modeling. DOE

N84-10528# Oak Ridge Gaseous Diffusion Plant, Tenn. Computer Sciences.
NUMERICAL STUDIES OF THE ISOTOPE DISTRIBUTION IN A GAS CENTRIFUGE USING A TAPERED, DOUBLE-PARABOLIC AXIAL FLOW
J. E. Park 1983 26 p refs Presented at the 5th Intern. Workshop on Gases in Strong Rotation, Charlottesville, Va., 5-9 Jun. 1983
(Contract W-7405-eng-26)
(DE83-013011; K/CSD-INF-83-3; CONF-830642-2) Avail: NTIS HC A03/MF A01

The isotope distribution in a gas centrifuge was solved by the Rome machine. The axial mass flux was specified to be of double parabolic form, with downflow in the region nearest the outer wall and upflow adjacent to the downflow. The magnitude of the upflow was varied axially to produce a tapered crossflow. Parameters for the axial taper were selected and the feed was selected to maximize the separative work. The numerical error due to the finite difference mesh was investigated. Two radial and five axial meshes were used. The separative works calculated using these meshes are presented, allowing an assessment of the error in the numerical technique. The effect of temperature variation on isotopic distribution was studied. Using a fixed double parabolic axial profile, the temperature was varied in a systematic fashion, which induced local changes in the pressure diffusion and the mass diffusion coefficient. The changes led to variations in the predicted values for separative work. DOE

N84-10529# Sandia Labs., Albuquerque, N. Mex.
NUMERICAL METHOD FOR COMPUTING FLOW THROUGH PARTIALLY SATURATED POROUS MEDIA
Roger R. Eaton 1983 20 p refs Presented at the 3rd Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Seattle, 8 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-007910; SAND-82-1962C; CONF-830803-5) Avail: NTIS HC A02/MF A01

This paper discusses the development of the finite element computer code SAGUARO which calculates the two-dimensional flow of mass and energy through porous media. The media may be saturated or partially saturated. SAGUARO solves the parabolic

time-dependent mass transport equation which accounts for the presence of partially saturated zones through the use of highly non-linear material characteristic curves. The energy equation accounts for the possibility of partially-saturated regions by adjusting the thermal capacitances and thermal conductivities according to the volume fraction of water present in the local pores. The code capabilities are demonstrated through the presentation of a sample problem involving the one dimensional calculation of simultaneous energy transfer and water infiltration into partially saturated hard rock. DOE

N84-10530# Hanford Engineering Development Lab., Richland, Wash.

COMPARISON BETWEEN MEASURED AND PREDICTED PERFORMANCE OF A HIGH SPEED, FREE SURFACE LIQUID JET FLOWING ALONG A CURVED WALL

J. A. Hassberger and W. C. Miller 1983 6 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn., 26-28 Apr. 1983

(Contract DE-AC06-76FF-02170)

(DE83-012728; HEDL-SA-2777; CONF-830406-56) Avail: NTIS HC A02/MF A01

Simple predictions of fluid velocities and pressures within a high speed, free surface, curved wall jet are shown to agree favorably with results obtained from hydraulic testing of full scale models. The wall jet described forms the design basis of the Fusion Materials Irradiation Test Facility Lithium Target, and has many similarities with wall jets considered for use in various wetted wall fusion reactor concepts. These comparisons show that simple techniques, both analytic and numerical, provide descriptions of the curved wall jet adequate for selection of design and operating parameters. DOE

N84-10531# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

MEASUREMENT OF TWO-PHASE FLOW VELOCITY USING A LASER DOPPLER ANEMOMETER

James R. Wolf, Thomas K. Larson, and Mark L. Wilson (TSI, Inc.) 1983 18 p refs Presented at the 29th Intern. Symp. of the Instrument Society of America, Albuquerque, N. Mex., 2 May 1983

(Contract DE-AC07-76ID-01570)

(DE83-013522; EGG-M-04383; CONF-830518-6) Avail: NTIS HC A02/MF A01

A laser Doppler anemometer (LDA) system was developed for the measurement of single- and two-phase flows. Measurements of both laboratory air/water and transient high temperature, high pressure steam/water flows were made. Results indicate that the LDA system is capable of making accurate velocity measurements under these types of conditions. DOE

N84-10532# Northwestern Univ., Evanston, Ill.

NONLINEAR STABILITY CONTROL

E. L. Reiss, J. A. Jendrzejczyk (ANL), and S. S. Chen (ANL) 1983 7 p refs Presented at the Symp. on Non-Linear Probl. in Energy Eng., Argonne, Ill., 26 Apr. 1983

(Contract W-31-109-eng-38)

(DE83-014341; CONF-830413-1) Avail: NTIS HC A02/MF A01

Integrated theoretical and experimental studies are performed with the purpose to enhance the understanding of nonlinear stability phenomena involving both fluids and solid structures and their coupling. The objectives are to contribute to the explanation of observed phenomena and, ultimately, to the solution of engineering design problems by means of stability control. The method involving application of a small-amplitude periodic disturbance to a nonlinear system is reported together with preliminary results from experiments with a tube conveying fluid. DOE

N84-10533# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

OIL/SALT HYDRATE DIRECT-CONTACT HEAT-EXCHANGE EXPERIMENTS

John D. Wright, Mark S. Bohn, and Robert S. Barlow Jan. 1983 26 p refs

(Contract DE-AC02-77CH-00178)

(DE83-009396; SERI/TR-252-1614) Avail: NTIS HC A03/MF A01

A pilot-scale, direct-contact heat exchanger/storage column has been operated to determine heat transfer performance, storage capability, and operational difficulties associated with direct-contact heat exchange and storage with an oil heat transfer fluid and salt hydrate latent-heat storage medium. A fundamental analysis of the heat transfer mechanisms in the direct-contact process between oil droplets and the salt hydrate storage medium has shown that, for a typical storage system, the oil outlet temperature will be well within 30 C of the storage temperature. This implies that power output at the end of a storage cycle will be reduced by less than 30% relative to the beginning of a cycle. Experimental evidence agrees with these results, in that very small temperature differences between the oil outlet and the storage were measured. Since performance of the column is not heat-transfer limited, it can be designed to provide the storage capacity required. Operational problems which were investigated included proper distribution of the oil in the salt hydrate and salt carryover in the exit oil lines. DOE

N84-10534# General Atomic Co., San Diego, Calif.

COMPARISON OF CALCULATED RESULTS FROM 2 ANALYTICAL MODELS WITH MEASURED DATA FROM A HEAT-EXCHANGER FLOW TEST

D. P. Carosella and P. N. Pavlics May 1973 7 p refs Presented at the Joint Power Generation Conf., Indianapolis, 25-29 Sep. 1983

(Contract DE-AT03-76ET-35301)

(DE83-013071; GA-A-16930; CONF-830905-3) Avail: NTIS HC A02/MF A01

Predicted results from both a network flow model and a turbulent flow model were compared with measured results from an air flow test on a half-scale model of the auxiliary heat exchanger for a high temperature gas cooled reactor. Measurements of both velocity and pressure were made within the heat exchanger shell side flow field. These measurements were compared with calculated results from both a network flow model and a turbulent flow model. Both analytical models predicted early identical results which, except for some minor anomalies, compared favorably with the measured data. DOE

N84-10535# General Dynamics Corp., San Diego, Calif.

AUXILIARY HEAT-EXCHANGER FLOW-DISTRIBUTION TEST

J. S. Kaufman and M. M. Bressler May 1983 7 p refs Presented at the Joint Power Generation Conf., Indianapolis, 25-29 Sep. 1983

(Contract DE-AT03-76ET-35301)

(DE83-012698; GA-A-16931; CONF-830905-2) Avail: NTIS HC A02/MF A01

The auxiliary heat exchanger flow distribution test was the first part of a test program to develop a water-cooled (tube-side), compact heat exchanger for removing heat from the circulating gas in a High-Temperature Gas-Cooled Reactor (HTGR). The function of this heat exchanger is to provide emergency cooldown for the HTGR. It is designed to operate over a wide range of helium or helium mixture conditions from depressurized to pressurized reactor operations. DOE

N84-10536# Los Alamos Scientific Lab., N. Mex.

OPTICAL PROPERTIES OF EXPLOSIVE-DRIVEN WAVES IN NOBLE GASES

C. R. Jones and W. C. Davis 1983 11 p refs Presented at the Soc. of Photo-Optical Instrumentation Conf., Santa Fe, N. Mex., 11-15 Apr. 1983

(Contract W-7405-eng-36)

(DE83-015236; LA-UR-83-1928; CONF-830425-35) Avail: NTIS HC A02/MF A01

High explosive were used to shock heat rare gases to brightness temperatures up to 36,0000K, with large radiating areas. Temperatures were determined from radiometer signals at both

280 and 520 nm. Shock velocities up to 9 mm/(SIGMA)s were used in both plane and cyclindrical geometries. Neon, argon, krypton, and xenon gases at atmospheric initial pressure were examined in plane shocks. Using argon, the effects of increased initial pressure were studied. For cylindrical shock expansion in argon, brightness temperatures were measured over a range of shock velocities from 3 to 9 mm/(SIGMA)s. Up to 4% of the explosive energy was emitted as radiation. The shock waves are found to be reasonable aproximations to blackbodies. DOE

N84-10537# National Bureau of Standards, Washington, D.C.
NUMERICAL PROCEDURE FOR AN INVISCID STABILITY ANALYSIS OF AN AXISYMMETRIC JET Final Report
Elizabeth F. Moore May 1983 13 p refs
(PB83-224071; NBSIR-83-2666) Avail: NTIS HC A02/MF A01 CSCL 20D

Inviscid stability analysis was applied to the mixing layer profile of an axisymmetric jet and a co-flowing stream. A collection of computer subprograms was developed to solve the resulting eigenvalue problem. The effect of changing the velocity profile and its parameters can be easily assessed. Results for Gaussian profiles are included. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-10538*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PORTABLE DYNAMIC PRESSURE GERNERATOR FOR STATIC AND DYNAMIC CALIBRATION OF IN SITU PRESSURE TRANSDUCERS
Pamela A. Bolt, Robert W. Hess, and William T. Davis Aug. 1983 15 p refs
(NASA-TM-85687; NAS 1.15:85687) Avail: NTIS HC A02/MF A01 CSCL 14B

A portable dynamic pressure generator was developed to meet the requirements of determining the dynamic sensitivities of in situ pressure transducers at low frequencies. The device is designed to operate in a frequency range of 0 to 100 Hz, although it was only tested up to 30 Hz, and to generate dynamic pressures up to 13.8 kPa (2 psi). A description of the operating characteristics and instrumentation used for pressure, frequency, and displacement measurements is given. The pressure generator was used to statically and dynamically calibrate transducers. Test results demonstrated that a difference an exist between the static and dynamic sensitivity of a transducer, confirming the need for dynamic calibrations of in situ pressure transducers. Author

N84-10539# Hughes Research Labs., Malibu, Calif.
NUCLEAR MAGNETIC RESONANCE GYROSCOPE Final Technical Report, 1 Sep. 1982 - 28 Feb. 1983
David M. Pepper and Harry T. M. Wang Apr. 1983 64 p refs
(Contract F49620-82-C-0095; F49620-80-C-0046; AF Proj. 2305)
(AD-A130102; AFOSR-83-0574TR) Avail: NTIS HC A04/MF A01 CSCL 17/7

A study of physics of a nuclear magnetic resonance gyroscope is described. Experimental results in nuclear polarization and relaxation in 3He are obtained using an optical pumping apparatus and a high resolution RF spectroscopic technique. Significant polarization in excited state neon was observed via collisional transfer from optically pumped helium in a cell filled with a mixture of helium and neon isotopes. The measured polarization was essentially independent of the isotopic composition. Moreover, the polarization of helium in the (He - Ne) binary system was not materially perturbed by the addition of the Ne (for our operating fill pressure). A sensitive RF NMR detection apparatus was fabricated and characterized. The required NMR linewidths of a dual-isotope NMRG sensor necessary to meet the required angular rate sensitivities were estimated. Although we were unable to detect the NMR ground state resonances directly, it is shown theoretically that the required rate sensitivities can be satisfied, given the anticipated output power and observed ground state polarization of helium. GRA

N84-10540# Naval Research Lab., Washington, D. C. Chemistry Div.
PHTHALOCYANINE DERIVATIVES SPECIFICALLY DESIGNED FOR FABRICATION OF ORGANIC SEMICONDUCTOR GAS SENSORS Interim Technical Report, 1 Mar. - 1 Jul. 1983
W. R. Barger, A. W. Snow, H. Wohltjen, J. Lint, and N. L. Jarvis 12 Jul. 1983 32 p refs Submitted for publication
(AD-A130611; NRL-TR-4) Avail: NTIS HC A03/MF A01 CSCL 11/9

This paper describes studies in which metal-free and metal substituted phthalocyanine films were sublimed onto the surfaces of interdigital electrodes in order to measure the change in the conductivity when the coated electrodes were exposed to a series of test gases. Also reported are data on tetracumylphenoxy and tetraoctadecyl ether derivatives of the metal-free and metal substituted phthalocyanines which were synthesized specifically for use as coating materials to be applied one monolayer at a time by the Langmuir-Blodgett (LB) method. Author (GRA)

N84-10541# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
LASER VELOCIMETER DEVELOPMENTS FOR SURVEYING THIN BOUNDARY LAYERS IN A MACH 6 HIGH REYNOLDS NUMBER FLOW Final Technical Report, Jun. - Dec. 1981
Charles H. OHeren, Daniel M. Parobek, and Clifford B. Weissman Feb. 1983 42 p refs
(AF Proj. 2404)
(AD-A130387; AFWAL-TR-82-3111) Avail: NTIS HC A03/MF A01 CSCL 14/2

Two-component fringe-counter type laser velocimeter techniques were developed to measure model boundary layer velocity profiles in a Mach 6 High Reynolds Number Wind Tunnel. Free stream velocities were approximately 3500 feet per second. Boundary layers as thin as 0.20 inches were surveyed to within .007 inches of the surface of a 16 inch wide sharp leading edge flat plate. Optical, signal processing, and computational techniques and equipment are discussed. Artificial flow field seeding of 1.0 to 2.0 micron particles was achieved in the facility stagnation section. This test program was conducted at stagnation pressures of 700 and 1400 psia. The stagnation temperature for the entire program was 1100 degrees R. Data rates of 2,000 per second were realized through the velocimeter test volume. GRA

N84-10542# Emory Univ., Atlanta, Ga. Dept. of Chemistry.
A PORTABLE, MICROPROCESSOR CONTROLLED, MULTICHANNEL FLUOROMETER FOR MARINE ANALYSIS Interim Technical Report
Philip Oldham, Gabor Patonay, and Isiah M. Warner 13 Jan. 1983 35 p refs
(Contract N00014-83-K-0026)
(AD-A130161; EMORY/DC/TR-83/1; TR-1) Avail: NTIS HC A03/MF A01 CSCL 14/2

The design of a portable, multichannel fluorometer which provides enhanced sensitivity and rapid data acquisition is described. The advantages of multidimensional fluorescence detection are discussed with special reference to the continuous monitoring of in vivo chlorophyll fluorescence in the marine environment. Sensitivity, detection limit, linearity of detection, and other parameters are used to evaluate the instrument design. Preliminary experiments are presented in regard to chlorophyll determinations in the open ocean. GRA

N84-10543# Honeywell Electro-Optics Center, Lexington, Mass.
USE OF HOLOGRAPHIC LINEAR FRINGE LINEARIZATION INTERFEROMETRY (FLI) FOR DETECTION OF DEFECTS Annual Report, 15 Jan. 1982 - 15 Jan. 1983
George O. Reynolds, Donald A. Servaes, John G. DeVelis, and Ronald A. Mayville Apr. 1983 73 p refs
(Contract F49620-82-C-0001; AF Proj. 2306)
(AD-A129323; AFOSR-83-0464TR; REPT-8303-22) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report describes the progress during Phase I on the two step Holographic Fringe Linearization Interferometry (FLI) Study. The FLI process consists of deflecting the object beam between holographic exposures to create linear fringes and spatially filtering of the image reconstructed from the hologram to discriminate between subsurface defects and random fringe noise. The fringe localization procedures utilized to put the linear fringes on the surface of interest are described. The design of the repeatable thermal deformation procedures used in the preliminary experiments are discussed. The design of both the holographic recording, reconstruction and spatial filtering systems are given. Preliminary experimental results show the separation of linear fringe information and random noise in the Fourier plane of the spatial filtering system. Various filter designs which enhance the images are also discussed. System feasibility is demonstrated for a triple exposure experiment in which controlled noise was added with a third exposure. Controlled loading experiments are shown to agree with the results predicted analytically with a simple bending finite element model. Plans for the work in Phase II are presented. Author (GRA)

N84-10544# Army Engineer Topographic Labs., Fort Belvoir, Va.
AN INSTRUMENT TO MONITOR THE TILT OF LARGE STRUCTURES
Kenneth Robertson Apr. 1983 32 p
(AD-A129598; ETL-0313) Avail: NTIS HC A03/MF A01 CSCL 13/13

The long-term or short-term tilt of structures such as locks or dams may be measured with an automatic level that has been temporarily modified for the purpose. The modifications consist of the addition of an autocollimating eyepiece and an optical vernier. A calibration mirror is also required for the measurement of long-term tilt. Accuracies of 1 to 5 seconds of tilt may be obtained. Author (GRA)

N84-10545# Stanford Univ., Calif. Dept. of Physics and Aeronautics-Astronautics.
BACKGROUND INFORMATION ON THE He(3) NUCLEAR GYROSCOPE Final Scientific Report, 1 Jun. 1978 - 30 Apr. 1982
William M. Fairbank and Michael Taber Feb. 1983 72 p refs
(Contract F49620-78-C-0088; AF Proj. 2305)
(AD-A130755; AFOSR-83-0579TR) Avail: NTIS HC A04/MF A01 CSCL 17/7

During the contract period the background necessary to proceed with the assembly and testing of the precision He(3) nuclear gyroscope was completed. This background work included experiments on He(3)-He(4) liquid and gas mixtures in a prototype apparatus which was modified to provide additional information useful to the He(3) gyroscope research program. The precision quartz He(3) gyroscope was designed, constructed and delivered during the period as were the components of the airlock and cryostat probe assembly. A new ultra-low magnetic field shield was made which achieved 2 x 10 to the 8th power/G over the volume necessary for the He(3)gyroscope. This not only exceeds the nominal requirements of the He(3) gyroscope, but is the lowest magnetic field region ever made. An engineering Ph.D thesis was completed by Captain Gerald Shaw, working with professor Daniel DeBra, on a theoretical analysis of the cross-axis response of a three-axis He(3) gyroscope and on kinematic rectification in a nuclear gyro. Author (GRA)

N84-10546# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
EVALUATION OF THE VARIABLE RELUCTANCE TRANSDUCER/CARRIER AMPLIFIER METHOD OF MEASURING LOW PNEUMATIC PRESSURES IN AERODYNAMIC AND PROPULSION TESTING Final Report, 1 Jan. 1975 - 1 Jun. 1981
Donald L. McCormick Feb. 1983 219 p refs
(AF Proj. 3066)
(AD-A130695; AFWAL-TR-82-2100) Avail: NTIS HC A10/MF A01 CSCL 14/2

A complete evaluation is presented of the Variable Reluctance Transducer/Carrier Amplifier combination as a possible solution to many low-pressure measurement problems in experimental aerodynamics and turbine engine testing. Characteristic steady-state precision and accuracy of the method are bracketed. The quantitative evaluation is based mainly on empirical data, and theory is only used to show the simplicity of the principles of transduction and analog signal processing involved. Effects of elective and sometimes arbitrary choices on the part of equipment designers upon system performance, reliability, and operational effectiveness are discussed. Author (GRA)

N84-10547# Ballistic Research Labs., Aberdeen Proving Ground, Md.
INSTABILITIES OF A GYROSCOPE PRODUCED BY RAPIDLY ROTATING, HIGHLY VISCOUS LIQUIDS Final Report
William P. DAmico, Jr. Jun. 1983 57 p refs Supersedes ARBRL-IMR-757
(DA Proj. 1L1-62618-AH-80)
(AD-A130874; AD-F300277; ARBRL-MR-03285; ARBRL-IMR-757) Avail: NTIS HC A04/MF A01 CSCL 17/7

A series of experiments were conducted to determine the yaw behavior of a gyroscope that contained a liquid-filled rotor. Spin rates, liquid viscosities, and cylinder geometries were selected to produce a wide range of Reynolds numbers ($5 < RE < 12{,}000$). Three cylinder aspect ratios (height/diameter) were tested: 1/1, 3/2, and 3/1. Coning frequencies for the free gyroscope were selected to be typical of spin-stabilized projectiles. Two distinct types of yaw behavior were observed with Reynolds number being the major controlling parameter. For $RE > 1{,}000$, the motion of the gyroscope was reasonably well predicted by classical liquid-filled shell theories that postulate a resonance between a natural frequency of the spinning liquid and the yaw frequency of the gyroscope. For these conditions the maximum yaw growth rate will occur when an eigenfrequency of the liquid is approximately equal to the gyroscope yaw frequency. For cases where $RE < 1{,}000$, the behavior of the gyroscope was not characterized by a resonant mechanism. Instead, the liquid-induced yaw moments and yaw growth rates grew monotonically with increasing yaw frequencies. GRA

N84-10548# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
SCANNING LASER DOPPLER ANEMOMETER AND ITS APPLICATION IN TURBULENT SEPARATED FLOW Technical Report, Mar. 1980 - Jun. 1983
Behrouz Chehroudi and Roger L. Simpson Jul. 1983 147 p refs
(Contracts N00014-79-C-0277; N00014-82-K-0554)
(AD-A130923; SMU-WT-7) Avail: NTIS HC A07/MF A01 CSCL 14/2

A rapidly scanning directionally-sensitive fringe-type Laser Doppler Anemometer (SLDA) which scans the measurement volume perpendicular to the optical axis of the transmitting optics is described. Scan frequencies up to 60 Hz over scan distances of 40 cm. have been used, although scan frequencies up to 150 Hz are possible. The maximum scanning velocity of the measurement volume that can be used is directly proportional to the shift frequency of the Bragg cell since each signal producing particle must cross a minimum number of fringes to produce a valid signal. Signal averaging bias is lower with a scanning LDA than with pointwise measurements. Results obtained for a separating turbulent boundary layer show that very good mean and rms velocity profiles of the fraction of time that the flow moves downstream can be obtained in less than one minute of data acquisition. Space-time correlations show that the degree of

coherence between outer region and near wall region increases as flow goes into separated zone. Author (GRA)

N84-10549# Sandia Labs., Albuquerque, N. Mex.
TRANSIENT-TEMPERATURES-MEASUREMENT ERRORS
N. R. Keltner, B. L. Bainbridge, and J. V. Beck (Michigan State Univ., East Lansing) 1983 19 p refs Presented at the 21st ASME/AIChE Natl. Heat Transfer Conf., Seattle, 24 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-006300; SAND-83-01610; CONF-830702-4) Avail: NTIS HC A02/MF A01

Estimation of transient temperature measurement errors which is often required to help understand thermal experiments and improve the accuracy of estimated thermal parameters is discussed. Thermal response models used in conjunction with experimental techniques are very effective. A hybrid of finite differences and the unsteady surface element method is developed and used for modeling temperature measurements made with intrinsic thermocouples and resistance temperature detectors. Experimental data obtained with the loop current step response method are used to estimate model parameters. DOE

N84-10550# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF A POINT-ELECTRODE CONDUCTIVITY SALINOMETER WITH HIGH-SPATIAL-RESOLUTION FOR USE IN VERY-SALINE SOLUTIONS
G. F. Jones, D. P. Grimmer, J. Tafoya, and T. J. Fitzgerald 1983 8 p refs Presented at the ASES Ann. Meeting, Minneapolis, 1-3 Jun. 1983
(Contract W-7405-eng-36)
(DE83-011170; LA-74-83-1113; CONF-830622-7) Avail: NTIS HC A02/MF A01

A conductivity probe and circuit were developed to measure salinities in sodium chloride ssalt gradient solar ponds. A point electrode salinometer design was chosen to give a spatial resolution of approximately 1 mm. The high spatial resolution was necessary to study the behavior of thermohaline columns in the vicinity of convective/conductive zone boundaries. The point electrode conductivity instrument was designed for use in up to 25 wt % salinities with immersion times of about 0.1 year or longer. Drift in the instrument, however, required periodic in situ calibration against the measured specific gravity of withdrawn fluid samples. DOE

N84-10551# Bendix Corp., Kansas City, Mo.
MULTI-DIRECTIONAL GAGING PROBE
R. J. Russell May 1983 41 p
(Contract DE-AC04-76DP-00613)
(DE83-012855; BDX-613-2896) Avail: NTIS HC A03/MF A01

Multi directional gaging probes provide simultaneous three axis position measurements for masuring accuracy, reduce setup errors, and provide direct real-time contour masurement when used in conjunction with the laser interferometer system. Two designs for a multi directional probe system were fabricated and tested to provide diect real time measurements. DOE

N84-10552# Hanford Engineering Development Lab., Richland, Wash.
FUSION MATERIALS IRRADIATION TEST FACILITY TEST-CELL INSTRUMENTATION
J. L. Fuller and R. J. Burke May 1982 20 p refs Presented at the Intern. School of Plasma Phys. Workshop on Diagn. for Fusion Reactor Conditions, Varenna, Italy, 6-17 Sep. 1982
(Contract DE-AC06-76FF-02170)
(DE83-012823; HEDL-SA-2714; CONF-8209944-8) Avail: NTIS HC A02/MF A01

Many of the facility instrumentation components and systems currently under development, though specifically designed for FMIT purposes, are similar to those useful for fusion reactors. Various ceramic-insulated signal-cable components are being evaluated for 14-MeV neutron tolerance. Thermocouples are shown to decalibrate in high energy fields. Nondestructive optical viewing of deuteron-induced residual gas flow is planned for beam profiling in real space and phase space. Various optics were irradiated to 10(18) n/cm(2) at 14 MeV with good results. Feasibility of neutron and gamma field imaging was demonstrated using pinhole collimator and microchannel plate devices. Infrared thermography and optical monitoring of the target surface is being investigated. Considerable experience on the compatibility of optical and insulator materials with (highly reactive) lithium was obtained. DOE

N84-10553# California Univ., Livermore. Lawrence Livermore Lab.
SIGNAL-PROCESSING CAPABILITIES OF A COMPUTERIZED ULTRASONIC SCANNING BRIDGE
Ronald L. McKinney, Don Boyd, Aki Kuramoto, and Bill McDonald 1983 24 p refs Presented at the Automated Non Destructive Evaluation Conf., Idaho Falls, Idaho, 28-30 Jun. 1983
(Contract W-7405-eng-48)
(DE83-013708; UCRL-89341; CONF-830652-1) Avail: NTIS HC A02/MF A01

Digital signal processing techniques were implemented using a computerized ultrasonic scanning bridge. Signals are processed in A-Scan, B-Scan, and C-Scan mode. In A-Scan mode general arithmetic and transform techniques such as addition, subtraction, multiplication, division, differential, integration, Fourier transforms and calculated functions are utilized. B-Scan mode signal processing options are analytic function, split spectrum processing, frequency domain windowing, and spatial averaging. In S-Scan mode available manipulations are addition, subtraction, multiplication, division, inversion, high and low pass filtering, and edge enhancement. A-Scans and B-Scans are processed using an array processor and a DEC (Digital Equipment Corp.) LSI 11/23 computer. C-Scan images are processed using a Peritek VC8-512Q graphics display board. Results have proved favorable both in processing time and in additional information provided by the techniques. DOE

N84-10554# Argonne National Lab., Ill. Materials Science and Technology Div.
HIGH-VOLTAGE ANALYTICAL ELECTRON MICROSCOPY
N. J. Zaluzec, A. Taylor, E. A. Ryan, and A. Philippides 1983 7 p refs Presented at the 7th Intern. Conf. on High Voltage Microscopy, Berkeley, Calif., 16-19 Aug. 1983
(Contract W-31-109-eng-38)
(DE83-014318; CONF-830819-3) Avail: NTIS HC A02/MF A01

The use of analytical and high voltage electron microscopies (AEM, HVEM) for microcharacterization is now well established as a powerful tool in both basic and applied materials research. There are, however, several fundamental limitations in the use of analytical electron microscopy in lower voltage instruments (100 to 200 kV) which restricts microanalysis - most notably multiple scattering. As a result of this, there is sufficient motivation to explore the merits of AEM-type microanalysis in the HVEM regime. This paper will discuss aspects of both qualitative and quantitative analysis at higher voltages, as well as the plans for upgrading the ANL 1.2 MeV HVEM (EM-7) for X-ray and electron energy loss spectroscopies (XEDS, EELS). DOE

N84-10555# National Bureau of Standards, Washington, D.C. National Engineering Lab.
DEVELOPMENT OF A CALORIMETER FORIMULTANEOUSLY MEASURING HEAT RELEASE AND MASS LOSS RATES
John Tordella and William H. Twilley Jun. 1983 36 p refs
(PB83-222711; NBSIR-83-2708) Avail: NTIS HC A03/MF A01 CSCL 14B

A heat release rate calorimeter (designated as NBS II) was designed, built, and put into operation. Heat release rate, mass loss rate, smoke, and heat of combustion of the unburned gaseous decomposition products are measured. A program involving through characterization of the instrument, obtaining reference heat release data for numerous materials, and conducting research in heat release rate and other flammability characteristics is recommended. GRA

N84-10556# National Bureau of Standards, Washington, D.C. National Measurements Lab.
PROJECT FOR IMPROVED PERFORMANCE OF RADIOMETRIC STANDARD DETECTORS (110-360 nm) Final Report
Robert P. Madden 20 Apr. 1983 15 p refs Sponsored in part by National Oceanic and Atmospheric Administration
(PB83-224014; NOAA-83062901) Avail: NTIS HC A02/MF A01 CSCL 14B

The Far Ultraviolet Physic Group of the Radiation Physics Division at NBS was issuing transfer standard photodiode detectors for the far UV for over a decade. It has recently become apparent that the photodiodes intended for use in the 1164-2437A spectral region, while having proven generally satisfactory, could likely be improved with certain changes in design. A group of photodiodes incorporating such design changes were obtained and the resulting performance was studied. Three areas were selected for redesign: Window seal; Photocathode location; and Photoelectron collection efficiency. GRA

N84-10557# Institute of Gas Technology, Chicago, Ill.
MEDIUM- AND HIGH-PRESSURE SONIC LEAK PINPOINTING Annual Report, Nov. 1981 - Oct. 1982
J. E. Huebler, C. J. Ziolkowski, J. M. Craig, and N. C. Saha May 1983 67 p refs Sponsored by Gas Research Inst.
(PB83-228361; GRI-81/0165) Avail: NTIS HC A04/MF A01 CSCL 14B

A detector to pinpoint natural gas leaks in medium and high pressure distribution systems (> 15psi) has been developed through the prototype stage. The device can detect acoustic emissions from leaking gas in the 2-5 KHz range. The actual leak pinpointing sensor, which is moved from one position to another above the pipe until the leak site is pinpointed, and a background noise monitor, offset from the pipe area, that is used to substract background noise from the signal developed by the leak pinpointing sensor. The prototype device is handportable, rugged, and low in cost, yet sensitive and easy to use in the field, as demonstrated with preliminary field tests. GRA

N84-10558# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ASSESSMENT OF ULTRASONIC REFERENCE BLOCK CALIBRATION METHODOLOGY Final Report
G. V. Blessing Jun. 1983 25 p refs
(PB83-225870; NBSIR-83-2710) Avail: NTIS HC A02/MF A01 CSCL 14B

The state of the art in aluminum ultrasonic reference block calibration practices is reviewed, especially as it has been guided by the recommended practices of the American Society for Testing and Materials for aluminum blocks. The principal system variable in the calibration procedures are identified, and recommendations for reducing their associated measurement errors are made. Quantitative evaluations of the limitations to improving measurement precision are made in light of present technology. Suggestions for improving present practices are made, and extensive reference to the relevant technical literature is made. Author (GRA)

N84-10559# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
STUDY ON CREEP-FATIGUE LIFE PREDICTION USING SIMPLE HIGH TEMPERATURE LOW CYCLE FATIGUE TESTING MACHINES
Tadayoshi Endo and Toshio Sakon May 1983 10 p refs
(PB83-224121; MTB-157) Avail: NTIS HC A02/MF A01 CSCL 14B

A simple high temperature low cycle fatigue testing machine for long time creep fatigue tests was developed and experiments on two kinds of CrMoV steel forgings and 304 stainless steel were carried out. The experimental results indicate: (1) the data obtained by long hold time tests deviate remarkably from the linear damage fraction rule. (2) Creep rupture ductility seems to be one of important factors for creep fatigue life after long time. (3) In the case of materials the creep rupture ductility makes a remarkable change with time. GRA

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Includes parametric amplifiers.

N84-10560# Northrop Research and Technology Center, Palos Verdes Peninsula, Calif.
SCALING STUDIES OF EFFICIENT RAMAN CONVERTERS Final Report, May 1981 - Apr. 1983
H. Komine, S. J. Brosnan, W. H. Long, Jr., J. Holliday, and E. Stappaerts 1 Jul. 1983 230 p refs
(Contract N00014-81-C-0637)
(AD-A130382; NRTC-83-09R) Avail: NTIS HC A11/MF A01 CSCL 20/6

This report contains the results of analytical and experimental work which address various technical issues relevant to the scalability of a Raman converter system to higher pulse energy and repetition rate for submarine laser communications applications. Specific areas investigated included heated XeF laser injection locking, repetitively-pulsed XeF laser Raman converter design, and scaling studies of Raman amplifiers in regard to conversion efficiency and beam quality. GRA

N84-10561# Beers Associates, Inc., Reston, Va.
CONTINUED INVESTIGATION OF THE ATOMIC PHYSICS OF FLASHLAMP PUMPED CESIUM-NEON LASERS Final Report
Ching-Sung Chang May 1983 35 p
(Contract N00014-82-C-2195)
(AD-A130223; BEERS-1-83-70-15) Avail: NTIS HC A03/MF A01 CSCL 20/5

In the present report, we are primarily concerned with atomic processes in a high pressure gas discharge. The theoretical endeavor is highlighted in a detailed calculation of spectral line profile, which are essential to meaningfully model an arc lamp performance. We also examine the effect of neon as a buffer gas in a high pressure cesium discharge tube. Under the conduction of comparable cesium and neon pressures, we concluded that neon buffer gas is beneficial to the overall lamp performance. The detailed discussion can be found in Reference 2. GRA

N84-10562# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-INDUCED BOUND STATES AT SURFACES: ION NEUTRALIZATION AND ADSORPTION
Kai-Shue Lam, Michael Hutchinson, and Thomas P. George Jun. 1983 16 p refs
(Contract N00014-80-C-0472)
(AD-A130278; UROCHESTER/DC/83/Tr-37) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two mechanisms for laser-generated bound states of a foreign species on a solid surface are discussed. The first, ion neutralization, leads to a bound electronic valence state of a projectile ion that is not degenerate with any electronic band states of the surface, while the second, radiative adsorption, gives a stable vibrational state of an adsorbed atom. The laser intensity plays the dominant role in the first process, whereas in the second a resonantly-tuned frequency is of greater importance. Author (GRA)

N84-10563# IBM Research Lab., San Jose, Calif. Dept. K46.
REMOTE SENSING APPLICATIONS OF PULSED PHOTOTHERMAL RADIOMETRY
A. C. Tam and B. Sullivan 16 Jun. 1983 16 p refs Submitted for publication.
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A130154; TR-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

The technique of pulsed photothermal radiometry (i.e., detection of the transient infrared thermal radiation from a condensed matter sample heated by a short-pulsed radiation is useful for signal-ended remote sensing applications. Applications for spectroscopic detection, measurement of absolute absorption coefficients in opaque materials, and sensing of dimensions or thermal properties in inhomogenous material are demonstrated. Theory of PPTR technique in the simple case of a semi-infinite homogenous material is described. GRA

N84-10564# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
Nd(3+): YAG LASER PUMPED SIMULTANEOUSLY BY CW AND PULSED LIGHT
Zhang Zhen Xi 12 Jul. 1983 7 p Transl. into ENGLISH from Jiguang (China), v. 8, no. 5, May 1981 p 48-49
(AD-A131092; FTD-ID(RS)T-0523-83) Avail: NTIS HC A02/MF A01 CSCL 20/5

A technique in which a Nd(3+): YAG laser in pumped by CW and pulsed light simultaneously is described. With compensation of thermal lensing effect, the laser can deliver laser light at low or high repetition rates with desirable stability and lifetime and the advantage of pumping by CW and pulsed light. GRA

N84-10565# Quanta-Ray, Inc., Mountain View, Calif.
LASER CHROMATOGRAPHY (GASEOUS ELECTROPHORESIS) OF CHEMICAL AGENTS Final Report, 20 May 1981 - 19 May 1983
David M. Lubman 30 Jun. 1983 14 p refs
(Contract DAAG29-81-C-0023)
(AD-A130948; ARO-17994.9-CH-S) Avail: NTIS HC A02/MF A01 CSCL 20/5

Experiments have shown plasma chromatography with laser produced ions to be a sensitive and selective method for detection of molecules in the environment at atmospheric pressure. This technique could in fact be used as a means of detecting chemical warfare agents in the environment. Inexpensive and relatively small excimer lasers are now becoming available, which would allow the practical development of a laser-based device. This device could be a mobile means of rapidly detecting CWA's under battlefield conditions. Author (GRA)

N84-10566# Ohio State Univ., Columbus. Electroscience Lab.
THE EFFECTS OF ATMOSPHERIC WATER VAPOR ABSORPTION ON INFRARED LASER PROPAGATION IN THE 5 MICROMETER BAND
L. G. Walter May 1983 94 p refs
(Contract DAAG29-81-K-0084)
(AD-A130788; ARO-17603.1-GS; ESL-713774-2) Avail: NTIS HC A05/MF A01 CSCL 20/14

The purpose of this study was to gather temperature dependent nitrogen broadened water vapor data at infrared frequencies of 1941.0952/cm, 1943.8624/cm, and 1949.2495/cm. This data is to be used to improve on the temperature characteristics of a far wing line shape model developed by M.E. Thomas and R.J. Nordstrom at the Ohio State University. In addition, the study investigated this 5.15 micrometer region for on-line/off-line resonance pairs for possible remote sensing of water vapor by DIAL techniques. The probe frequencies of 1941.0952/cm, 1943.8624/cm and 1949.2495/cm were generated by frequency doubling with a CdGeAs2 crystal pumped by a C02 laser lasing on the R(12), R(14) and R(18) lines of the (00 deg 1-10 deg 0) band, respectively. Due to experimental uncertainties in the data obtained during the study, only a general temperature characteristic of the absorption for the investigated laser lines was obtained. The data did show agreement with the far wing line shape model to a first order approximation; however, the study concluded that more accurate data is needed before a more detailed analysis can be made of the absorption versus temperature for these lines. A possible on-line/off-line pair for DIAL applications was also found-the doubled C02 R(18) and R(20) lines, respectively. Author (GRA)

N84-10567# Joint Technical Coordinating Group for Aircraft Survivability, Washington, D.C.
MODIFIED QKLOOK PROGRAM, CHANGE 1
18 Jul. 1983 248 p
(AD-A131507; JTCG/AS-79-V-008-CHG-1) Avail: NTIS HC A11/MF A01 CSCL 19/4

Recently, the four QKLOOK programs, in the earlier reports, were extensively modified. The modification were made to increase the usefulness and ease of use of the QKLOOK model. The changes made (1) increase the user's control of the PK/H functions used in QKLOOK, (2) allow the user to select true or incremental vulnerable areas, and (3) brought the programs in line with the FORTRAN 77 standards. All the changes are thoroughly documented. The program VAMERGE, which re-formats the QKLOOK output into a form usable by the ASALT program, has been documented and is also included in this change. GRA

N84-10568# Naval Research Lab., Washington, D. C.
DESIGN AND OPERATION OF A COLLECTIVE MILLIMETER-WAVE FREE-ELECTRON LASER
R. H. Jackson, S. H. Gold, R. K. Parker, H. P. Freund, and P. C. Efthimion 27 Jul. 1983 40 p refs
(SF68342602)
(AD-A131628; NRL-MR-5076) Avail: NTIS HC A03/MF A01 CSCL 20/6

A new free-electron laser experiment has been designed at NRL to operate at millimeter wavelengths using a collective beam-wave interaction. Critical features of the experiment include an apertured diode which provides a low emittance electron beam, a wiggler magnet with adiabatic entrance and exit, and an operational domain centered around the wiggler-guide field gyroresonnance. With the experiment configured as a superradiant amplifier, the effects of the gyroresonnance on beam dynamics and the beamwave interaction have been studied. Measurements indicate a peak power production of 35 MW at 4 mm with an electronic efficiency of 2.5%. Aspects of the experimental design are discussed, and the results of a parametric study of the power dependence on the fields are presented. Detailed calculations (both analytic and computational) have been performed to analyze the linear and nonlinear effects in the experiment. The results of these calculations are shown to be in good agreement with laboratory measurements. GRA

N84-10569# Los Alamos Scientific Lab., N. Mex.
HIGH-REPETITION-RATE AMPLIFICATION OF 16 (SIGMA) MICRON RADIATION
N. A. Kurnit, D. E. Watkins, and G. W. York 1983 27 p refs Presented at Los Alamos Conf. on Opt., Santa Fe, N. Mex., 11-15 Apr. 1983 Submitted for publication
(DE83-012782; LA-UR-83-1441; CONF-830425-19) Avail: NTIS HC A03/MF A01

High repitition rate generation of up to 325 mJ of Raman amplified radiation near 615 cm(+1) was demonstrated in CO2-pumped para-H2 using a low power, microwave shifted CF4 laser as an input Stokes seed source. Experiments were limited to 200 Hz, but single shot Schlieren measurements indicate that our flowing room temperature 44 pass Raman converter should be capable of the design goal of 1 KHz. Strong conversion was achieved even with no flow at 100 Hz. Details of the overall system design, experimental parameters, and present system limitations are discussed. DOE

N84-10570# Sandia Labs., Albuquerque, N. Mex.
ULTRAVIOLET-LASER TRIGGERING OF A 5-MEGAVOLT MULTISTAGE GAS SWITCH
R. G. Adams, W. B. Moore, J. R. Woodworth, M. M. Dillon, F. Morgan, and K. J. Penn 1983 12 p Presented at the IEEE Power Electron. Spec. Conf., Albuquerque, N. Mex. 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013641; SAND-83-0108C; CONF-830621-26) Avail: NTIS HC A02/MF A01

Ultraviolet laser triggered switching experiments have successfully controlled the operation of a 5-mv, multistage gas switch. A comparison between KrF and frequency quadrupled Nd:YAG at various laser energies has revealed superior switching performance using the KrF laser. A new switching diagnostic utilizing optica fibers to view switch fluorescence has yielded detailed information about behavior of individual stages of the multistage gas switch. DOE

N84-10571# Sandia Labs., Albuquerque, N. Mex.
E-BEAM PULSEWIDTH SCALING FOR A LARGE KrF LASER
Juan J. Ramirez 1983 8 p refs Presented at the IEEE Power

Electron. Spec. Conf., Albuquerque, N. Mex., 6 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013632; SAND-83-0270C; CONF-830621-21) Avail: NTIS HC A02/MF A01

Electron-beam generator engineering trade-offs involved in decreasing the output duration of a large KrF laser by a factor of two so as to double the peak power delivered to an ICF target are discussed. A 25 kJ amplifier module based on either a 500 nsec or 250 nsec e-beam pump was studied. DOE

N84-10572# Missouri Univ., Rolla. Dept. of Physics.
EXPERIMENTAL DETERMINATION OF TRANSPORT COEFFICIENTS IN CO2 LASER GAS MIXTURES Final Report, 1 Jan. 1981 - 31 May 1983
I. M. Littlewood May 1983 37 p
(Contract DE-AS08-81DP-40135)
(DE83-013638; DOE/DP-40134/1) Avail: NTIS HC A03/MF A01

The electron ion recombination coefficient was measured in a variety of gas mixtures containing helium, nitrogen, and carbon dioxide at different pressures and with differing relative concentrations. The results are of importance to the development of high energy CO2 lasers. A pressure dependent recombination rate was found for CO2 and for mixtures of nitrogen and carbon dioxide. This observation is interpreted as the effects of two and three body recombination reactions. In contrast, no pressure dependence was found for any of the mixtures containing helium. DOE

N84-10573# California Univ., Livermore. Lawrence Livermore Lab.
PULSE POWER FOR THE RAPIER B AMPLIFIER KrF LASER SYSTEM
L. G. Schlitt 25 May 1983 5 p Presented at the IEEE Power Electron. Specialists Conf., Albuquerque, N. Mex., 6-8 Jun. 1983
(Contract W-7405-eng-48)
(DE83-012951; UCRL-88615; CONF-830621-11) Avail: NTIS HC A02/MF A01

The RAPIER B Amplifier electron beam system was completed and produces 36kJ of 450 keV electrons in a 150 ns pulse to be used for pumping a KrF laser amplifier. The operating characteristics of the system was studied. The efficiency of conversion of energy stored in the Marx generator to electron beam output is 72 + or - 3% including an 89% designed transfer efficiency. The system is triggered electrically with a 150 ns delay from the command trigger to machine output. The rms jitter for the six individual modules range from 1.6 to 3.9 ns and the average timing difference between the earliest and latest module output is 12 ns. Film dosimetry indicates no observable interaction between the magnetically isolated beams in the module diodes and fluorescence measurements do not indicate strong interaction in the gas filled laser cell. Probe measurements show no significant change in beam size during the output pulse. Energy deposition profiles agree reasonably with Monte Carlo calculations up to pressures of 1.5 atm. DOE

N84-10574# Tracer Technologies, Inc., Newton, Mass.
EVALUATION OF A LASER-BASED PHOTOACOUSTIC SPECTROMETER IN MEASUREMENT OF STABLE-ISOTOPE RATIOS
Fraser Walsh May 1983 30 p refs
(Contract DE-AC02-82ER-60063)
(DE83-014628; DOE/ER-60063/1) Avail: NTIS HC A03/MF A01

The use of the stable isotope of carbon, C-13, as a tracer in oil/gas exploration or in medical diagnosis was limited by the inconvienence of the use of the ratio mass spectrometer. The availability of an operator-easy, low cost, accurate and precise analytical instrument capable of high throughput would increase the use of C-13 as a tracer. A laser-based photoacoustic spectrometer was developed and tested, and its capabilities in (C-13)O2/(C-12)O2 measurement demonstrated. A signal analysis system was developed, which, when coupled with a RF-modulated CO2 laser and an improved spectrophone, provided high levels of precision and accuracy in CO2 and (C-13)O2 measurement. CO2 concentrations were measured with this system at a pecision of + or - 0.0003%; (C-13)O2/(C-12)O2 was measured with a precision of + or - 0.004%. Recommended directions include use of a higher power (C-13)O2 laser, a dual spectrophone system for internal signal normalization, and system redesign to account for the effect of moisture in samples. DOE

N84-10575# Los Alamos Scientific Lab., N. Mex.
USE OF FIBER OPTICS AND LASER-INDUCED FLUORESCENCE FOR REMOTE MEASUREMENTS OF UF6 IN STRONG ROTATION
S. W. Allison (Oak Ridge Gaseous Diffusion Plant, Tenn.), D. M. Magnuson (Oak Ridge Gaseous Diffusion Plant, Tenn.), M. R. Cates (Oak Ridge Gaseous Diffusion Plant, Tenn.), R. A. Gentry, S. E. Caldwell, L. A. Franks (Edgerton, Germeshausen and Greer, Inc., Santa Barbara, Calif.), M. A. Nelson (Edgerton, Germeshausen and Greer, Inc., Santa Barbara, Calif.), and T. J. Davies (Edgerton, Germeshausen and Greer, Inc., Santa Barbara, Calif.) 1983 32 p refs Presented at the 5th Intern. Workshop on Gases in Strong Rotation, Charlottesville, Va., 6 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014195; LA-UR-83-1699; CONF-830642-4) Avail: NTIS HC A03/MF A01

Laser-induced fluorescence (LIF) and other laser-based techniques are being employed in an increasing number of gas and flow field diagnostic applications. In some instances, the necessary instrumentation requires unavailable space and is not portable. Sometimes the process region of interest is relatively inaccessible. These factors complicate and hinder deployment of laser diagnostic techniques. A fiber optics based method for delivering the laser and for returning optical signals can be used to circumvent these problems. Reported here is a demonstration of a fiber optics system for remote monitoring of UF6 density and temperature by the LIF method. The description consists of a discussion of a fiber system that conveys the laser beam to the points of interest and a fiber system which transmits the LIF signal to a photomultiplier tube. Representative results from a static gas cell and a centrifuge are presented. DOE

N84-10576# Los Alamos Scientific Lab., N. Mex.
ALIGNMENT TELESCOPE FOR ANTARES
Q. D. Appert, T. A. Swann, J. H. Ward, C. Hardesty, and L. Wright 1983 7 p Presented at the Los Alamos Conf. on Optics '83, Santa Fe, N. Mex., 11-15 Apr. 1983
(DE83-014179; LA-UR-83-1667; CONF-830425-26) Avail: NTIS HC A02/MF A01

The Antares Automatic Alignment System employs a specially designed telescope for alignment of its laser beamlines. There are two telescopes in the system, and since each telescope is a primary alignment reference, stringent boresight accuracy and stability over the focus range were required. Optical and mechanical designs, which meet this requirements as well as that of image quality over a wide wavelength band, are described. Special test techniques for initial assembly and alignment of the telescope are also presented. The telescope, which has a 180-mm aperture FK51-KZF2 type glass doublet objective, requires a boresight accuracy of 2.8 (SIGMA)rad at two focal lengths, and object distances between 11 meters and infinity. Travel of a smaller secondary doublet provides focus from 11 m to infinity with approximately 7.8 m effective focal length. By flipping in a third doublet, the effective focal length is reduced to 2.5 m. Telescope alignment was accomplished by using a rotary air bearing to establish an axis in front of the system and placing the focus of a Laser Unequal Path Interferometer (LUPI) at the image plane. DOE

N84-10577# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Research Div.
VELOCITY INTERFEROMETRY FOR TIME-RESOLVED HIGH-VELOCITY MEASUREMENTS
Lynn M. Barker 1983 11 p refs Presented at the 27th Ann. Intern. Tech. Symp. on High Speed Phot., Videography and Photonics, San Diego, Calif., 21 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013968; SAND-83-0919C; CONF-830874-5) Avail: NTIS

HC A02/MF A01

The laser interferometer development is reviewed, and the characteristics of some of the systems which have been found useful are discussed. Some past and possible future applications of laser velocity interferometry are also mentioned. Particular attention is given to the Velocity Interferometer System for Any Reflector (VISAR), Wide Angle Michelson Interferometer (WAMI), and the Fabry-Perot Velocimeter. DOE

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-10578 Duke Univ., Durham, N. C.
ELECTROHYDRODYNAMICS Ph.D. Thesis
Luther Daniel Flippen, Jr. 1982 156 p
Avail: Univ. Microfilms Order No. DA8304661

The objectives of this research are to develop a rational basis for the equations of electrohydrodynamics, electrically driven flow, and flow-dominated electrodynamics, and to develop a theory for laminar electrically driven flow. An order of magnitude analysis shows the exact conditions under which the induced magnetic fields in electrohydrodyamics can be neglected, leaving only a fluid flow-electric field coupling. Electrically driven flow and flow-dominated electrodynamics are derived as special cases of electrohydrodynamics based mainly on the parameter omega, which represents the ratio of the applied and induced pressure forces to the electric body forced. The equations of the flow-dominated case, based on large omega, are shown to reduce to those of classical fluid mechanics and a set of linear equations for the electrodynamics which depend on the fluid flow solution. The equations of electrically driven flow are incompressible, with nonlinear electrical equations which uncouple from the fluid mechanics. Dissert. Abstr.

N84-10579 Northwestern Univ., Evanston, Ill.
TEMPERATURE ANALYSIS IN LUBRICATED SIMPLE SLIDING ROUGH CONTACTS Ph.D. Thesis
Wei-Tang Lai 1982 200 p
Avail: Univ. Microfilms Order No. DA8305494

Temperature analysis is important in understanding the scuffing failure. Ling and Pu's approach in the temperature analysis of dry plastic sliding contact is extended to the lubricated elastic rough contact. First, the rough surfaces are computer simulated by using Patir's program to have the same surface height distribution and autocorrelation function. A program is developed to calculate the contact pressures and real contact areas of the elastic rough surface contacting a rigid plane. Assuming constant frictional coefficients for shearing lubricant at noncontact area, shearing surface film at asperity contacts and shearing oxide film as the asperity exceeds the critical temperature, the asperity temperature distribution can be calculated. Eight cases in Durkee and Cheng's scuffing test of simple sliding contact are simulated by using 20 computer generated rough surfaces. The results show that scuffing is closely related to the high temperature asperities which are above the softening temperature of the material. Dissert. Abstr.

N84-10580 Ohio State Univ., Columbus.
MODELING OF THE TRANSMISSIBILITY THROUGH ROLLING-ELEMENT BEARINGS UNDER RADIAL AND MOMENT LOADS Ph.D. Thesis
Mohammad Dawod Rajab 1982 286 p
Avail: Univ. Microfilms Order No. DA83305382

Vibrations of rotating machinery housing panels are typically the result of the transmission of force excitations through the bearings of shaft mounted elements such as gears and rotors. The location and type of bearings which support the shafts in these machine housings has a profound effect on the transmission of moments and forces from the shaft to the housing. The modeling of rolling element bearings under radial loads, bending moments, and/or axial loads is discussed. Under these loads, the bearing was modeled by radial and rotational stiffnesses. The stiffnesses were average stiffnesses obtained by dividing the load (i.e., the radial or bending moment) by the corresponding deflection. The bearing loads and deflections were found by solving the nonlinear equations of the bearing shaft system. Approximate load deflection relationships for the bearings were used in the analysis. A building block type of analysis was used to study the bearing model in a shaft bearing plate system. The analytical response at selected plate locations compared favorably with the experiment at several discrete off resonant frequencies. Various parametric studies were conducted which further verified the bearing model. Dissert. Abstr.

N84-10581*# Detroit Diesel Allison, Indianapolis, Ind.
ADVANCED GAS TURBINE (AGT): POWER-TRAIN SYSTEM DEVELOPMENT Semiannual Report, Jan. - Jun. 1982
H. E. Helms, R. A. Johnson, R. K. Gibson, and L. B. Smith Aug. 1983 64 p
(Contracts DEN3-168; DE-AI01-77CS-51040)
(NASA-CR-168056; DOE/NASA/0168-5; NAS 1.26:168056; DDA-EDR-11185; SAR-5) Avail: NTIS HC A04/MF A01 CSCL 07E

Technical work on the design and effort leading to the testing of a 74.5 kW (100 hp) automotive gas turbine is described. The general effort was concentrated on building an engine for test starting in July. The buildup progressed with only routine problems and the engine was delivered to the test stand 9 July. In addition to the engine build effort, work continued in selected component areas. Ceramic turbine parts were built and tested. Burst tests of ceramic rotors show strengths are approaching that achieved in test bars; proof testing is required for acceptable strength ceramic vanes. Over 25 hours was accumulated on the combustor rig in three test modes: pilot nozzle only, start nozzle, and main nozzle operation. Satisfactory ignition was achieved for a wide range of starting speeds and the lean blowout limit was as low as 0.06 kg/b (0.14 lb/hr). Lean blowout was more a function of nozzle atomization than fuel/air ratio. A variety of cycle points were tested. Transition from start nozzle flow to main nozzle flow was done manually without difficulty. Regenerator parts were qualification tested without incident and the parts were assembled on schedule. Rig based performance matched first build requirements. Repeated failures in the harmonic drive gearbox during rig testing resulted in that concept being abandoned for an alternate scheme. Author

N84-10582*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
SPACE APPLICATIONS OF AUTOMATION, ROBOTICS AND MACHINE INTELLIGENCE SYSTEMS (ARAMIS). VOLUME 3, PHASE 2: EXECUTIVE SUMMARY Final Report
D. L. Akin, M. L. Minsky, E. D. Thiel, and C. R. Kurtzman Washington NASA Oct. 1983 42 p refs
(Contract NAS8-34381)
(NASA-CR-3736; NAS 1.26:3736; SSL-32-83-Vol-3-Phase-2) Avail: NTIS HC A03/MF A01 CSCL 05H

The field of telepresence is defined, and overviews of those capabilities that are now available, and those that will be required to support a NASA telepresence effort are provided. Investigation of NASA's plans and goals with regard to telepresence, extensive literature search for materials relating to relevant technologies, a description of these technologies and their state of the art, and projections for advances in these technologies are included. Several space projects are examined in detail to determine what capabilities are required of a telepresence system in order to accomplish various tasks, such as servicing and assembly. The key operational and technological areas are identified, conclusions and recommendations are made for further research, and an example developmental program leading to an operational telepresence servicer is presented. Author

N84-10583*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.

SPACE APPLICATIONS OF AUTOMATION, ROBOTICS AND MACHINE INTELLIGENCE SYSTEMS (ARAMIS), PHASE 2. VOLUME 1: TELEPRESENCE TECHNOLOGY BASE DEVELOPMENT Final Report

D. L. Akin, M. L. Minsky, E. D. Thiel, and C. R. Kurtzman Oct. 1983 106 p refs

(Contract NAS8-34381)

(NASA-CR-3734; NAS 1.26:3734; SSL-30-83) Avail: NTIS HC A06/MF A01 CSCL 05H

The field of telepresence is defined, and overviews of those capabilities that are now available, and those that will be required to support a NASA telepresence effort are provided. Investigation of NASA's plans and goals with regard to telepresence, extensive literature search for materials relating to relevant technologies, a description of these technologies and their state of the art, and projections for advances in these technologies over the next decade are included. Several space projects are examined in detail to determine what capabilities are required of a telepresence system in order to accomplish various tasks, such as servicing and assembly. The key operational and technological areas are identified, conclusions and recommendations are made for further research, and an example developmental program is presented, leading to an operational telepresence servicer. Author

N84-10584*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.

SPACE APPLICATIONS OF AUTOMATION, ROBOTICS AND MACHINE INTELLIGENCE SYSTEMS (ARAMIS), PHASE 2. VOLUME 2: TELEPRESENCE PROJECT APPLICATIONS Final Report

D. L. Akin, M. L. Minsky, E. D. Thiel, and C. R. Kurtzman Washington NASA Oct. 1983 116 p refs

(Contract NAS8-34381)

(NASA-CR-3735; NAS 1.26:3735; SSL-31-83) Avail: NTIS HC A06/MF A01 CSCL 05H

The field of telepresence is defined and overviews of those capabilities that are now available, and those that will be required to support a NASA telepresence effort are provided. Investigation of NASA' plans and goals with regard to telepresence, extensive literature search for materials relating to relevant technologies, a description of these technologies and their state of the art, and projections for advances in these technologies over the next decade are included. Author

N84-10585# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aerodynamics and Airframe Branch.

SELF EXCITED OSCILLATIONS IN JOURNAL BEARINGS Final Report, Jun. - Sep. 1981

Wilbur L. Hankey 12 Mar. 1983 24 p refs

(AF Proj. 2307)

(AD-A130200; AFWAL-TR-83-3026) Avail: NTIS HC A02/MF A01 CSCL 20/4

Under certain rotation rates, a rotor, supported by an oil-lubricated journal bearing, can experience excessive shaft vibration. Two types of oscillations can exist called oil whirl and oil whip. Oil whirl produces a circular orbit in a direction of the same sense as the shaft rotation but at a value of about 45% of the shaft rotation speed. Oil whip is a more violent oscillation which occurs at the resonance frequency of the shaft system. Both of these oscillations are predicted in this report by obtaining an analytic description of the fluid forces and inserting these into the dynamic equations for the rotor system. Oil whirl is shown to be an auto rotation, omega, of the journal centroid at a rate of one half of the shaft rotational speed. Oil whip is shown to occur when the frequency of autorotation exceeds the natural frequency of the shaft system. GRA

N84-10586# AiResearch Mfg. Co., Torrance, Calif.

HIGH-SPECIFIC-ENERGY COMPOSITE-MATERIAL FLYWHEEL Final Report

29 Mar. 1983 119 p refs

(Contract W-7405-eng-48)

(DE83-012943; UCRL-15529) Avail: NTIS HC A06/MF A01

A flywheel rotor was designed and fabricated to demonstrate energy densities ranging from 50.6 watt-hour/kg (23 watt-hour/lb) to 88 watt-hour/kg (40 watt-hour/lb). The design is composed of a multiring rim made of S-2 glass/epoxy and Kevlar/epoxy composite materials, mounted on a four spoke aluminum and graphite/epoxy composite hub. Ten flywheel rotors were produced for test. DOE

N84-10587# Science Applications, Inc., Albuquerque, N. Mex. Alternate Energy Systems Div.

EVALUATION OF PUMPS FOR WIND-DRIVEN IRRIGATION Final Report

P. L. Marjon and R. N. Clark (Dept. of Agriculture, Bushland, Tex.) Nov. 1982 174 p refs

(Contract DE-AI01-76ET-20319)

(DE83-013438; DOE/ARS-7315-20741-83-1) Avail: NTIS HC A08/MF A01

A survey of a variety of pumping equipment that can be used for wind power irrigation applications is presented. Data are developed and sample results are presented on the economics of wnd driven irrigation pumps as compared with other types of energy source-irrigation pump contributions. Conclusions are presented on the economics of wind driven irrigation pumps and suggestions are given for improving the economic potential. DOE

N84-10588# Sandia Labs., Albuquerque, N. Mex.

HELIUM/SOLID POWDER O-RING LEAKAGE CORRELATION EXPERIMENTS

W. B. Leisher, S. H. Weissman, D. R. Tallant, and M. Kubo (Power Reactor and Nuclear Fuel Development Corp., Tokyo,) 1983 10 p refs Presented at the 7th Intern. Symp. on Packaging and Transportation of Radioactive Mater., New Orleans, La., 15 May 1983

(Contract DE-AC04-76DP-00789)

(DE83-013773; SAND-82-1947C; CONF-830528-38) Avail: NTIS HC A02/MF A01

A method to test powder leakage that has passed O-ring seals was developed. The method was validated by a test fixture with 98 ng of U and recovered 130 +25 ng of U. The method was applied to the leakage of UO2 powder passing the type of EPDM O-ring seals used in a SNM shipping cask belonging to PNC. It appears that the level of external contamination is negligible and it is assumed that the U-quantities greater than 26 ng passed the primary O-ring seal. From this limit d-quantity of data, no apparent correlation between the amount of U measured and either helium leak rate or equivalent tube diameter are observed. The data for the 1300C tests indicate the possibility of a U/time relationship. DOE

N84-10589# Avco Corp., Wilmington, Mass.

DESIGN AND FABRICATION OF A FIBERGLASS CIRCULAR-WEAVE COMPOSITE FLYWHEEL

Alan D. Sapowith and Arthur L. Gurson Livermore, Calif. California Univ., Lawrence Livermore Lab. Jan. 1983 33 p refs

(Contract W-7405-eng-48)

(DE83-013406; UCRL-15536; AVSD-0020-83-CR) Avail: NTIS HC AJ3/MF A01

A detailed design of a hub for a fiberglass circular-weave composite flywheel is described. The fabrication procedures used are discussed, and the procedures and costs are projected in a high-volume production. Data on the flywheel to be tested are listed. DOE

N84-10590# Exfluor Research Corp., Austin, Tex.

NEW FLUOROCARBON ELASTOMERS FOR SEALS FOR GEOTHERMAL AND OTHER AGGRESSIVE ENVIRONMENTS Final Report

R. J. Lagow Dec. 1982 77 p refs Prepared for Brookhaven National Lab., Upton, N.Y.

(Contract DE-AC02-76CH-00016)

(DE83-014424; BNL-33129) Avail: NTIS HC A05/MF A01

Saturated ethyllenic elastomers having a range of methyl group substitution, and a range of partial fluorine substitution were

screened. Elastomers based on vinylidene fluoride hexafluoropropylene and those based on tetrafluoroethylene propylene (alternating) were successfully crosslinked by electro beam radiation and fluorinated to yield elastomeric products, but those based on ethylene-propylene-diene (EPDM) elastomer became brittle after fluorination. The best products were evaluated using tensile strength, elongation at break, solvent swelling, thermogravimetric analysis and infrared. A wide range of carbon black filled compositions using the TFEP elastomer were cross linked. The compositions were then fluorinated at or near room temperature for extended periods of time. After fluorination the samples were subjected to geothermal brine at 3000C. The best carbon black filled composition again lasted at least 100 days in the geothermal brine. This filler-elastomer composition was chosen for use in the production of O rings. The O rings were produced by compression molding using a 30 ton hydraulic press. Various sizes of O rings were produced ranging from 0.8 to 2.0 inches in diameter and from 1/16 to 3/16 inches in width. The Final O rings were crosslinked at 40 Mrad and fluorinated under the optimized conditions developed for the samples. DOE

N84-10591# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
PROBABILISTIC ASSESSMENT OF WELD QUALITY IN STEEL PIPING UNDER SEISMIC CONDITIONS
Nabil G. Awadalla, David A. Crowley, and Wen-Foo Yau 1983 15 p refs Presented at the 7th Intern. Conf. on Structural Mech. in Reactor Technol. (SMIRT-7), Chicago, 22-26 Aug. 1983 Submitted for publication
(Contract DE-AC09-76SR-00001)
(DE83-012053; DP-MS-82-77; CONF-830805-38) Avail: NTIS HC A02/MF A01

Seismic stress analysis of plant piping systems usually ignore the possibility of reduced joint strength due to weld imperfections. This paper presents a method that might be used to assess the impact of weld imperfections in a piping system, provided that limited destructive examination of welded joints is possible. A probability distribution function of weld quality is developed from the destructive examination, and this combined with an experimentally determined relationship between weld quality and reduced strength. This latter is the result of uniaxial tensile testing of specimens with controlled imperfection. A seismic stress probability distribution function is determined by conventional seismic analysis. The above quantities are used to quantify the conditional failure probability of the imperfect weld. Effect of imperfection distribution within a given weld on the probability of failure is discussed. DOE

N84-10592# Pennsylvania State Univ., University Park. Materials Research Lab.
MECHANISMS OF WEAR IN SINGLE AND TWO-PHASE MATERIALS Annual Progress Report
N. H. Macmillan and K. Tsuda Jun. 1983 56 p refs
(Contract DE-AC02-82ER-12037)
(DE83-014651; DOE/ER-12037/1; APR-1) Avail: NTIS HC A04/MF A01

The overall aim is to study the way in which wear processes depend on (1) the natures - i.e., the microstructures and the elastic-plastic responses - and (2) the relative motions of bodies which comes into contact. To this end specimens of four monophasic materials (a high Pb silicate glass, A1203, Pb and Cu and four diphasic composites of tailored microstructure made from these (containing 30 to 80 vol.% of approx. 200 (SIGMA)m particles of either A12O3 or Cu in matrices of either Pb or the high Pb silicate glass) have been prepared, characterized in various ways, and in some cases subjected to rolling-tumbling-sliding wear in a specially constructed apparatus, using angular WC-8 wt.% Co particles approximately 500 (SIGMA)m in diameter as the erosive medium. Comparative low velocity erosion studies, using the same particles and the same target materials, have also been started. Finally, to augment the post-facto weight loss and fractographic studies that have so far formed the mainstays techniques of these wear studies, work has begun on the tasks of applying two other techniques to them: high-speed cinematography and in-situ stress measurement by embedded piezoelectric transducers. DOE

N84-10593# Oak Ridge Y-12 Plant, Tenn. CAD/CAM and Information Systems Dept.
COMPUTER-INTEGRATED MANUFACTURING (CIM): TURNING VISIONS TO REALITY
K. R. Haeusler 1983 26 p Presented at the Am. Soc. for Eng. Management Ann. Meeting, Washington, 17 Oct. 1983
(Contract W-7405-eng-26)
(DE83-015481; Y/CP-17; CONF-8310131-1) Avail: NTIS HC A03/MF A01

Methods used to gain management awareness and support for a seven-year, $70 million capital investment program are described. The development and scoping of requirements for the envisioned systems; obstacles to be overcome in implementing the technology; techniques used to gain general acceptance and involvement; financial planning; the status of the program; and an assessment of the prospects for final success are also discussed. DOE

N84-10594# Oregon State Univ., Corvallis.
EFFECT OF LOW-PROOF FUEL ALCOHOL ON CRANKCASE OIL DILUTION IN AN OTTO-CYCLE ENGINE Final Report
John G. Mingle and Richard W. Boubel Jul. 1983 39 p
(Contract DE-AS19-80BC-10343)
(DE83-016425; DOE/BC-10343/1) Avail: NTIS HC A03/MF A01

A laboratory experiment, using a 1974 model year Ford, 2.3 liter, 4 cylinder overhead cam engine, was conducted to evaluate those parameters which might result in the dilution of crankcase oil with excessive amounts of alcohol or water. Ethanol of 130 to 180 proof was used in the engine for a test duration of six hours (unless the color of the oil changed indicating presence of water). Air to fuel mixture ratio was held at a value which gave constant yields of about 1 percent carbon monoxide in the exhaust gases, although two additional tests were conducted where the carbon monoxide in the exhaust was increased to about 6 percent to determine the gross effect of mixture ratio. Twenty-four engine tests were conducted, and the crankcase oil was sampled after each test was completed. Tests were also conducted at reduced engine oil and water temperature. Five standard ASTM and two nonstandard analytical tests were employed to determine the quantitative amount of alcohol and/or water found in the crankcase oil. ASTM D-95, water by distillation, and ASTM D-96, water by centrifuge, appear to be the most reliable analytical tests to determine the amount of water. DOE

N84-10595# Massachusetts Inst. of Tech., Cambridge. Lab. for Manufacturing and Productivity.
IMPROVEMENT OF RELIABILITY OF WELDING BY IN-PROCESS SENSING AND CONTROL (DEVELOPMENT OF SMART WELDING MACHINES FOR GIRTH WELDING OF PIPES) Final Report
David E. Hardt, Koichi Masubuchi, Henry M. Paynter, and William C. Unkel Apr. 1983 82 p refs
(Contract DE-AC02-79ER-10474)
(DE83-017012; DOE/ER-10474/4) Avail: NTIS HC A05/MF A01

Closed-loop control of the welding variables represents a promising, cost-effective approach to improving weld quality and therefore reducing the total cost of producing welded structures. The ultimate goal is to place all significant weld variables under direct closed-loop control; this contrasts with preprogrammed machines which place the welding equipment under control. As the first step, an overall strategy has been formulated and an investigation of weld pool geometry control for gas tungsten arc process has been completed. The research activities were divided into the areas of arc phenomena, weld pool phenomena, sensing techniques and control activities. DOE

N84-10596# Pacific Northwest Lab., Richland, Wash. Energy Systems Engineering Sect.
TECHNICAL AND ECONOMIC INVESTIGATIONS OF A LOW-TEMPERATURE RANKINE-CYCLE HEAT ENGINE
R. G. Cavola and S. G. Hauser Aug. 1983 8 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21-26 Aug. 1983

(Contract DE-AC06-76RL-01830)
(DE83-016757; PNL-SA-11067; CONF-830812-40) Avail: NTIS HC A02/MF A01

A low temperature Rankine cycle heat engine was examined using a systems analysis perspective and two analysis approaches - one based on maximizing thermodynamic performance, the other based on minimizing levelized energy costs. In the analyzed system, the engine draws its energy from a salt gradient solar pond that has an average temperature of 860C. A computer code developed for the analysis include models for the solar pond, the piping systems, the economic analysis, and the heat engine. The effects of varying system parameters (including the working fluid) on thermodynamic performance and plant costs are presented, and predictions of cycle efficiency and system cost are given for several system designs. The two analysis approaches are compared. Results demonstrate that the approach based on minimizing the plant levelized energy cost can select system parameters to produce the most economical plant, identifying subtle but important tradeoffs between thermodynamic performance and economics. DOE

N84-10597# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.
HIGH-TEMPERATURE-TURBINE-TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES Final Report
Feb. 1983 127 p
(Contract DE-AC01-76ET-10348)
(DE83-015200; CW-WR-76-020.111; FE-2291-111-A) Avail: NTIS HC A07/MF A01

Transpiration air cooling for the turbine blades and vanes was selected because it is the most effective air cooling concept known and because it has the potential to be highly resistant to the erosion, corrosion and deposition that could occur from contaminants expected to be present in coal derived fuels. Demonstration of the capability of transpiration air cooling to perform satisfactorily up to 30000F and to resist the attack of solid and liquid particulate matter and high levels of alkali metals was accomplished using two full scale gas turbine engines and associated combustor/starter cascade rigs. The first of these engines was a low pressure turbine operating with turbine inlet pressure of 3 atm. The second engine, the Turbine Spool Technology Rig, was designed to duplicate in full scale the high pressure spool turbine of a 17:1 pressure ratio, 2 spool gas turbine unit of 70 MW electric output. The demonstration of turbine performance and durability was reinforced by development of two combustor designs - one using simulated LBG fuel and the other using coal liquid combustor designs - one using simulated LBG fuel and the other using coal liquid SRC-2 fuel. DOE

N84-10598# Approved Engineering Test Labs., Fullerton, Calif.
STAGED COLLISION AND DAMAGE DATA REPORT FOR ACCIDENT RECONSTRUCTION OF FOURTEEN (14) TEST VEHICLES (1980 - 1982 MODEL YEAR), VOLUME 1 Final Report, Jan. 1981 - Mar. 1983
D. H. Hand Mar. 1983 306 p
(Contract DOT-HS-9-02273)
(PB83-228502; DOT-HS-806-379-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 13L

Information regarding vehicle to rigid barrier and moving barrier versus vehicle crash test damage and acceleration data relative to accident reconstruction is presented. The residual crush and accelerometer traces along with other related data including post impact photographs are included. GRA

N84-10599# Trochoid Power Corp., Eden Prairie, Minn.
POSITIVE DISPLACEMENT ROTARY COMPRESSOR FOR VAPOR COMPRESSION Final Report, Jan. 1981 - Jul. 1982
R. H. Roche and L. L. Robbins Aug. 1982 27 p
(PB83-232744; GRI-5080-342-0389) Avail: NTIS HC A03/MF A01 CSCL 13G

Economic savings may be realized by the use of mechanical vapor compression heat pumps to upgrade waste steam to process-useful temperatures. The feasibility of an advanced positive displacement rotary vapor compressor was proven through intensive engineering, design, manufacturing and testing operations. Significant features of the proof-of-concept unit are epitrochoidal design, high compression ratios, high speed valves, ease of balancing, and compact size. GRA

N84-10059*# Boeing Commercial Airplane Co., Seattle, Wash.
SECONDARY ELECTRIC POWER GENERATION WITH MINIMUM ENGINE BLEED
Gordon E. Tagge *In* NASA. Lewis Research Center Aircraft Elect. Secondary Power Jun. 1983 p 37-50 (For primary document see N84-10055 01-37)
Avail: NTIS HC A09/MF A01 CSCL 01C

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-10600# Delaware Univ., Newark. Inst. for Applied Mathematics.
ASYMPTOTIC METHODS IN RELIABILITY THEORY: A REVIEW
Ilya B. Gertsbakh (Ben Gurion Univ.) Sep. 1982 57 p refs
(Grants AF-AFOSR-3236-77; NSF ENG-79-08351; AF Proj. 2304)
(AD-A130163; AFOSR-83-0548TR; REPT-80B) Avail: NTIS HC A04/MF A01 CSCL 12/1

Works related to reliability evaluation of nonrenewable systems are reviewed. The assumption that element failure rates are low allows to obtain an expression for the main term in the asymptotic representation of system reliability function and renewable systems are discussed. The main index of interest in reliability is the time to the first system failure. A typical situation in reliability is that the repair time is much smaller than the element lifetime. This fast repair property leads to an interesting phenomenon that for many renewable systems the time to system failure converges in probability, under appropriate norming, to exponential distribution. Some basic theorems explaining this fact are presented and a series of typical examples is considered. Special attention is paid to reviewing the works describing the exponentiality phenomenon in the birth and death processes. Some important aspects of computing the normalizing constants are considered, among them, the role played by so called main event. Various bounds on the deviation from exponentiality are reviewed and some additional aspects of asymptotics in reliability are described. It is typical for the probabilistic models considered in these sections, that a small parameter is introduced in an explicit form into the characteristic of the random processes. A considerable part of this review is based on the sources. GRA

N84-10601# Argonne National Lab., Ill.
DEVELOPMENTAL TECHNIQUES FOR ULTRASONIC FLAW DETECTION AND CHARACTERIZATION IN STAINLESS STEEL
David S. Kupperman Apr. 1983 20 p refs Presented at the Specialist Meeting on Defect Detection and Sizing, Ispra, Italy, 3 May 1983
(Contract W-31-109-eng-38)
(DE83-014282; CONF-830562-2) Avail: NTIS HC A02/MF A01

Flaw detection and characterization by ultrasonic methods for stainless steel was studied. Two specific problem areas are discussed: (1) the inspection of centrifugally cast stainless steel (CCSS) and (2) the differentiation of intergranular stress corrosion cracking (IGSCC) from geometrical reflectors such as the weld root. To help identify optimal conditions for the ultrasonic inspection the effect of frequency on propagation of longitudinal and shear waves was examined in both isotropic and anisotropic samples. Good results were obtained with isotropic CCSS and 0.5-MHz angle beam shear waves. The use of beam scattering

patterns as a tool for discriminating IGSCC from geometrical reflectors is discussed. DOE

N84-10602# Bendix Corp., Kansas City, Mo.
DEVELOPMENT OF NONDESTRUCTIVE FULL-TEST REQUIREMENTS FOR GOLD WIRES ON MULTILAYER THICK-FILM HYBRID MICROCIRCUITS
R. J. Blazek Jun. 1983 31 p refs Submitted for publication
(Contract DE-AC04-76DP-00613)
(DE83-014368; BDX-613-2859R) Avail: NTIS HC A03/MF A01

Thermosonic wire bonding is used to attach 1-mil gold wires to multilayer thick film hybrid microcircuits. A realistic, nondestructive pull test limit which would detect unacceptable wire bonds and would be compatible with production processes without applying excessive stress to the wires was developed. The effect of environmental testing on wire bond strength was also examined. A 1.5-gf nondestructive pull test limit was incorporated into production which provided an adequate screen for unacceptable bonds without significantly increasing rework time and cost for wire failures. No degradation of wire bond strengths resulted from environmental testing. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-10603 Rensselaer Polytechnic Inst., Troy, N. Y.
THE USE OF AFFINE TRANSFORMATIONS IN THE ANALYSIS OF STABILITY AND VIBRATIONS OF ORTHOTROPIC PLATES Ph.D. Thesis
Gabriel Audu Oyibo 1981 218 p
Avail: Univ. Microfilms Order No. DA8311652

Transformations to solve the stability and vibrations problems of specially orthotropic plates are proposed. The affine transformations define the similarity rules for these plates, thereby reducing the numerous parameters (elastic constants) in the orthotropic literature to two. These affinely transformed parameters are the Generalized Poisson's Ratio and the Generalized Rigidity Ratio. With the help of these similarity rules, problems of a generic rather than a specific, specially orthotropic plate can be solved at one time. To this end, therefore, the virtual work principles for establishing the equations of motion/equilibrium of a specially orthotropic plate with classical displacement assumptions are formulated and mapped into the affine plane. These partial differential equations of motion, depending on the boundary conditions, are solved either exactly, using the Separation of Variables method or approximately, using the Rayleigh-Ritz or Lagrangian Multipliers method. Dissert. Abstr.

N84-10604 Michigan Univ., Ann Arbor.
LIMIT ANALYSIS OF PLATES BY A FINITE ELEMENT APPROACH Ph.D. Thesis
Song-Ling Young 1982 88 p
Avail: Univ. Microfilms Order No. DA8304635

A variational principle for plastic plate bending problems is formulated in accordance with the upper bound theorem. A finite element representation using nonconforming elements for the plate deflection field is imposed. The load carrying capacity of a plate is then sought by a minimization process in a finite dimensional space. An effective quadratic programming technique is used for the minimization process. The collapse loads for a square and a circular plate with simply supported and clamped boundary conditions under uniform pressure are solved. The results are consistant with the existing solutions which are based on different yield criteria. The optimal support problem of a square and a rectangular plate with four support points is solved by maximizing the sequence of minimal solutions. This finite element approach is economical, easily handles arbitrary shape of plate, arbitrary lateral load and general boundary conditions, and thus applies to a wide class of applications in optimal design. Dissert. Abstr.

N84-10605 Northwestern Univ., Evanston, Ill.
MATHEMATICAL MODELS FOR INELASTIC BEHAVIOR AND CRACKING OF CONCRETE STRUCTURES Ph.D. Thesis
Byung Hwan Oh 1982 215 p
Avail: Univ. Microfilms Order No. DA8305506

Development of the realistic mathematical models to describe the inelastic behavior of concrete caused by microcracking or cracking was investigated. Several interrelated aspects of the problem are studied, including the fracture of concrete structures, the spacing and width of cracks in reinforced concrete members, the deformation of cracked net reinforced concrete walls and the strain rate effect of concrete. A fracture theory for concrete in which the fracture zone is not small compared to structural dimensions and exhibits gradual strain softening due to microcracking is developed first. Simple triaxial stress-strain relations which model the strain softening and describe the effect of crack formation and extension on the deformations are derived. The material fracture properties are characterized by only three parameters-fracture energy, tensile strength and width of the crack band. The theory is verified by comparisons with numerous experimental data from the literature. Dissert. Abstr.

N84-10606 Pittsburgh Univ., Pa.
ELASTO-PLASTIC ANALYSIS OF PLANE STRESS PROBLEMS USING UNIAXIAL SYMMETRIC TRESCA YIELD SURFACE AND KINEMATIC HARDENING Ph.D. Thesis
Mohammad RezaieePajand 1982 190 p
Avail: Univ. Microfilms Order No. DA8305581

A formulation based upon incremental plasticity with the assumption of small displacement theory is presented for the plane stress problem. The formulation uses the associated flow rule of the uniaxial symmetric Tresca yield condition. This load surface is applicable to materials with different tensile and compressive yield strengths, as well as materials with equal tensile and compressive yield strength. For the uniaxial symmetric Tresca yield locus, constitutive laws are established for materials which obey the kinematic hardening rule. Ziegler's modification of Prager's rule is utilized. The finite element technique is applied to both the incremental equilibrium equation for static problems and the incremental equation of motion for dynamic problems. Based upon the formulation, some test problems are analyzed. The procedure demonstrates the ability to trace the elasto-plastic behavior of materials under either cyclic static or dynamic loading. Both tension weak materials and materials with equal yield strength in tension and compression are used in these examples. Dissert. Abstr.

N84-10607# British Library Lending Div., Boston Spa (England).
A METHOD OF SOLVING DUCTILITY THEORY PROBLEMS
Yu. G. Gulyaev and V. M. Druyan 14 Jul. 1983 3 p Transl. into ENGLISH from Izv. (USSR), p 150
(BLL-M-35125-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

When the components of deformation tensors (deformation rates) and stresses are determined, the rate and stress fields obtained must satisfy differential equilibrium equations or power equations (since these equations are interchangeable) and boundary conditions. When the power equations in the ductility theory are solved by the direct Rayleigh-Ritz method, nonuniformity of deformation within a body, the shape of which can be altered, is represented by the varied parameters a sub i included in the initial equation for movements (or rates); the work (power) of the forces of friction is evaluated in terms of the friction index alpha from the Zibel condition. S.L.

N84-10608*# Houston Univ., Tex. Dept. of Electrical Engineering.
VIBRATION CONTROL OF LARGE LINEAR QUADRATIC SYMMETRIC SYSTEMS Ph.D. Thesis
Gi Joon Jeon Oct. 1983 104 p refs

(Contracts NsG-1603; NAG1-370)
(NASA-CR-174536; NAS 1.26:174536) Avail: NTIS HC A06/MF A01 CSCL 20K

Some unique properties on a class of the second order lambda matrices were found and applied to determine a damping matrix of the decoupled subsystem in such a way that the damped system would have preassigned eigenvalues without disturbing the stiffness matrix. The resulting system was realized as a time invariant velocity only feedback control system with desired poles. Another approach using optimal control theory was also applied to the decoupled system in such a way that the mode spillover problem could be eliminated. The procedures were tested successfully by numerical examples. N.W.

N84-10609*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARAMETRIC TIP EFFECTS FOR CONFORMABLE ROTAR APPLICATIONS
Wayne R. Mantay and William T. Yeager, Jr. Aug. 1983 31 p refs
(DA Proj. 1L2-62209-AH-76)
(NASA-TM-85682; NAS 1.15:85682; AVRADCOM-TR-83-B-4) Avail: NTIS HC A03/MF A01 CSCL 20K

A research study was initiated to systematically determine the impact of selected blade tip geometric parameters on aeroelasticity conformable rotor performance and loads characteristics. The model articulated rotors included baseline and torsionally soft blades with interchangeable tips. Seven blade tip designs were evaluated on the baseline rotor and three tip designs were tested on the torsionally soft blades. The designs incorporated a systematic variation in three geometric parameters: sweep, taper, and anhedral. The rotors were evaluated in the NASA Langley Transonic Dynamics Tunnel at several advance ratios, lift and propulsive force values, and tip Mach numbers. Based on the test results, tip parameter variations generated significant rotor performance and loads difference for both baseline and torsionally soft blades. Azimuthal variation of elastic twist generated by the tip parameters strongly correlated with rotor performance and loads, but the magnitude of advancing blade elastic twist did not correlate. Author

N84-10610*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROMECHANICAL STABILITY OF A HINGELESS ROTOR IN HOVER AND FORWARD FLIGHT: ANALYSIS AND WIND TUNNEL TESTS
William T. Yeager, Jr., M-Nabil H. Hamouda (Vigyan Research Associates, Inc.), and Wayne R. Mantay Aug. 1983 21 p refs Prepared in cooperation with Army Aviation Research and Development Command
(DA Proj. 1L2-62209-AH-76)
(NASA-TM-85683; NAS 1.15:85683; AVRADCOM-TR-83-B-5) Avail: NTIS HC A02/MF A01 CSCL 20K

A research effort of analysis and testing was conducted to investigate the ground resonance phenomenon of a soft in-plane hingeless rotor. Experimental data were obtained using a 9 ft. (2.74 m) diameter model rotor in hover and forward flight. Eight model rotor configurations were investigated. Configuration parameters included pitch flap coupling, blade sweep and droop, and precone of the blade feathering axis. An analysis based on a comprehensive analytical model of rotorcraft aerodynamics and dynamics was used. The moving block was used to experimentally determine the regressing lead lag mode damping. Good agreement was obtained between the analysis and test. Both analysis and experiment indicated ground resonance instability in hover. An outline of the analysis, a description of the experimental model and procedures, and comparison of the analytical and experimental data are presented. S.L.

N84-10611*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VERTICAL DROP TEST OF A TRANSPORT FUSELAGE SECTION LOCATED FORWARD OF THE WING
M. Susan Williams and Robert J. Hayduk Aug. 1983 57 p refs
(NASA-TM-85679; NAS 1.15:85679) Avail: NTIS HC A04/MF A01 CSCL 20K

A Boeing 707 fuselage section was drop tested at the NASA Langley Research Center to measure structural, seat, and occupant response to vertical crack loads. Post-test inspection showed that the section bottom collapsed inward approximately 2 ft. Preliminary data traces indicated maximum normal accelerations of 20 g on the fuselage bottom, 10 to 12 g on the cabin floor, and 6.5 to 8 g in the pelvises of the anthropomorphic dummies. Author

N84-10612*# Dayton Univ., Ohio. Aerospace Mechanics Div.
A TOTAL LIFE PREDICTION MODEL FOR STRESS CONCENTRATION SITES Final Report
G. A. Hartman and D. S. Dawicke Sep. 1983 33 p refs
(Grant NAG3-246)
(NASA-CR-168225; NAS 1.26:168225; UDR-TR-83-57) Avail: NTIS HC A03/MF A01 CSCL 20K

Fatigue crack growth tests were performed on center crack panels and radial crack hole samples. The data were reduced and correlated with the elastic parameter K taking into account finite width and corner crack corrections. The anomalous behavior normally associated with short cracks was not observed. Total life estimates for notches were made by coupling an initiation life estimate with a propagation life estimate. Author

N84-10613*# United Technologies Research Center, East Hartford, Conn.
RESEARCH AND DEVELOPMENT PROGRAM FOR THE DEVELOPMENT OF ADVANCED TIME-TEMPERATURE DEPENDENT CONSTITUTIVE RELATIONSHIPS. VOLUME 1: THEORETICAL DISCUSSION Final Report
Brice N. Cassenti Jul. 1983 127 p refs
(NAS3-23273)
(NASA-CR-168191; NAS 1.26:168191; R83-956077-1-Vol-1) Avail: NTIS HC A07/MF A01

The results of a 10-month research and development program for the development of advanced time-temperature constitutive relationships are presented. The program included (1) the effect of rate of change of temperature, (2) the development of a term to include time independent effects, and (3) improvements in computational efficiency. It was shown that rate of change of temperature could have a substantial effect on the predicted material response. A modification to include time-independent effects, applicable to many viscoplastic constitutive theories, was shown to reduce to classical plasticity. The computation time can be reduced by a factor of two if self-adaptive integration is used when compared to an integration using ordinary forward differences. During the course of the investigation, it was demonstrated that the most important single factor affecting the theoretical accuracy was the choice of material parameters. Author

N84-10614*# United Technologies Research Center, East Hartford, Conn.
RESEARCH AND DEVELOPMENT PROGRAM FOR THE DEVELOPMENT OF ADVANCED TIME-TEMPERATURE DEPENDENT CONSTITUTIVE RELATIONSHIPS. VOLUME 2: PROGRAMMING MANUAL Final Report
Brice N. Cassenti Jul. 1983 58 p refs
(Contract NAS3-23273)
(NASA-CR-168191; NAS 1.26:168191; R83-956077-2-Vol-2) Avail: NTIS HC A04/MF A01

The results of a 10-month research and development program for nonlinear structural modeling with advanced time-temperature consitutive relationships are presented. The implementation of the theory in the MARC nonlinear finite element code is discussed, and instructions for the computational application of the theory are provided. Author

N84-10615# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF BONDING TEMPERATURES ON FATIGUE CRACK GROWTH Final Report, May 1981 - Aug. 1982

Rodney L. Wilkinson and John M. Potter Feb. 1983 62 p refs (AF Proj. 2401)
(AD-A130396; AFWAL-TR-82-3058) Avail: NTIS HC A04/MF A01 CSCL 11/6

Changes in the crack growth behavior of 7075-T651 aluminum specimens which has been exposed to temperatures between 150 degrees and 355 degrees F (66 deg and 179 deg C) were evaluated. Specimens were fatigue tested at room temperature under flight-by-flight loading conditions. Results from these tests were then compared with data from the baseline (as received) material. Exposure to 250 deg F (121 deg C) or more produced a definite increase in specimen life, apparently due to a decrease in crack growth rates. GRA

N84-10616# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Metals Behavior Branch.
STATISTICS OF CRACK GROWTH OF A SUPERALLOY UNDER SUSTAINED LOAD Final Report, Jan. - Jun. 1982
J. N. Yang (George Washington Univ.) and R. C. Donath Dec. 1982 55 p refs
(AF Proj. 2307)
(AD-A130395; AFWAL-TR-82-4102) Avail: NTIS HC A04/MF A01 CSCL 11/6

A statistically-formulated fracture mechanics model for crack growth under sustained load is used to analyze crack growth data from 23 compact tension specimens of IN100, a turbojet engine disc material. The procedures characterize crack growth rates is a lognormal random variable. The mean and standard deviation of the growth rate are determined from test data using the method of maximum likelihood. The method estimates crack growth rate parameters for each test specimen result. From these estimates, a lognormal creep crack growth rate model is developed from which is derived a statistical distribution of the crack size at any time. The distribution of time to reach some critical crack size is also presented. These distributions allow for the determination of the effect of hold time in the loading cycle on the life prediction of gas turbine engine discs. Author (GRA)

N84-10617# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.
FORCED VIBRATION OF TIMOSHENKO BEAMS OF MULTIMODULAR MATERIALS
F. Gordaninejad and C. W. Bert Jun. 1983 35 p refs Presented at the 19th ASME Conf. on Mech. Vibration and Noise, Dearborn, Mich., 12-14 Sep. 1983
(Contract N00014-78-C-0647; NR Proj. 064-609)
(AD-A130372; OU-AMNE-83-2; TR-33) Avail: NTIS HC A03/MF A01 CSCL 11/10

This paper presents a transfer-matrix analysis for determining the sinusoidal vibration response of thick, rectangular-cross-section beams made of multimodular materials (i.e., materials which have different elastic behavior in tension and compression, with nonlinear stress-strain curves approximated as piecewise linear). An experimentally determined stress-strain curve for aramid-cord rubber is approximated by four straight-line segments (two segments in tension and two segments in compression). To validate the transfer-matrix results, a closed-form solution is also presented for the special case in which the neutral-surface location is uniform along the length of the beam. Also, comparisons are made among multimodular, bimodular (two line segments), and unimodular models. Numerical results for axial displacement, transverse deflection, bending slope, bending moment, transverse shear and axial forces, and the location of the neutral surface are presented for the multimodular model. Effects of translatory and rotatory inertia coefficients on axial force are investigated for a clamped-clamped beam. Moreover, natural frequencies associated with the first three modes of a clamped-free beam are presented. Transfer-matrix results agree very well with the closed-form results for the corresponding material model (one, two, or four segments). GRA

N84-10618# Washington Univ., Seattle. Dept. of Mechanical Engineering.
ADVANCED EXPERIMENTAL TECHNIQUES IN CRACK TIP ANALYSIS
A. S. Kobayashi Jun. 1983 27 p refs
(Contract N00014-76-C-0060; NR Proj. 064-478)
(AD-A130719; UWA/DME/TR-83/48) Avail: NTIS HC A03/MF a01 CSCL 20/11

Advanced experimental techniques in crack tip mechanics are discussed under three categories of 2 and 3-D linear elastic, 2-D elasto-plastic and 2-D dynamic fracture mechanics. Specific techniques which were discussed are acousto-elasticity, frozen stress-moire technique, isodyne photoelasticity, moire technique, laser speckle method, hybrid experimental-numerical analysis and caustic method. GRA

N84-10619# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
FURTHER RESULTS ON THE PREDICTIONS OF COLLAPSE PRESSURE OF A RING STIFFENED CYLINDRICAL SHELL SUBJECT TO HYDROSTATIC PRESSURE
Minos Moussouros Sep. 1982 68 p refs
(AD-A130877; AD-F500168; NSWC/TR-82-172) Avail: NTIS HC A04/MF A01 CSCL 20/11

This study reassesses the critical static buckling load of a ring reinforced circular shell as obtained by the nonlinear finite element code STAGS for a variety of boundary conditions and compares it more conclusively with values from other sources. The influence of a rectangular opening on the elastic buckling strength is also addressed. A modeling procedure is being recommended for such problems. GRA

N84-10620# Defence Research Establishment Pacific, Victoria (British Columbia).
APPLICATION OF FRACTOMAT/KRAK GAGES TO CRACK GROWTH MEASUREMENTS IN STRUCTURAL COMPONENTS
K. I. McRae Jul. 1982 19 p refs
(AD-A130945; DREP-82-3) Avail: NTIS HC A02/MF A01 CSCL 20/11

Accurate crack size measurements are required for fracture mechanics' solution to component life predictions. Usual methods have limitations and the development of a real-time crack measurement technique would be of great value. The operation and accuracy of the 'Fractomat' device for crack growth measurement is assessed during its normal application to standard fracture mechanics specimens. The technique is found to be at least as accurate as surface microscopic examination. The further application of this technique to crack measurement of in-service flaw location and orientation are known. The potential application is then demonstrated by examination of crack growth during the laboratory fatigue fracture of a typical aircraft structural component, the forward wing trunnion of the CF-100 aircraft. Author (GRA)

N84-10621# SRI International Corp., Menlo Park, Calif.
DYNAMIC PULSE BUCKLING, THEORY AND EXPERIMENT. HANDBOOK
Herbert E. Lindberg and Alexander L. Florence 1 Feb. 1983 400 p refs
(Contract DNA001-78-C-0287; DNA Proj. N99-QAXA)
(AD-A130910; DNA-6503H) Avail: NTIS HC A17/MF A01 CSCL 20/11

This monograph brings together research results on dynamic buckling from reports and technical papers produced during the past two decades by the authors and their co-workers at SRI International (formerly Stanford Research Institute). Much of the original research was sponsored by DNA, either directly or through the Air Force Weapons Laboratory. We focus on buckling from intense loads, well above static buckling loads, but of short enough duration that the buckle amplitudes can be small and cause no serious damage. We present a systematic development of dynamic pulse buckling, from simple elastic buckling of bars to the most recent developments in biaxial plastic flow buckling of shells. Emphasis is on developing an understanding of the buckling processes and on making available practical theory that can be used for estimating buckling strengths of structural elements (bars,

plates, rings, shells) under a variety of pulse loadings. Familiarity with static buckling in these elements is assumed, but most derivations are made from fundamental principles so that the monograph can be used as a graduate level textbook. Each chapter is written to be understood independently so that the practicing engineer can go directly to the theory and experiment most appropriate to a specific problem. Author (GRA)

N84-10622# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
SEMIELLIPTICAL CRACKS ALONG HOLES IN PLATES AND LUGS Final Report, 5 Jan. 1981 - 30 Nov. 1982
A. F. Grandt, Jr., J. A. Harter, and D. E. Tritsch Wright-Patterson AFB, Ohio AFWAL May 1983 136 p refs
(Contract F33615-81-K-3206; AF Proj. 2307)
(AD-A130786; AFWAL-TR-83-3043) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report summarizes a basic research effort directed at characterizing the growth of semielliptical surface cracks embedded along the bore of a hole in a large plate or an attachment lug. Fatigue cracks are grown in transparent polymer test specimens which allow in situ observation of the crack plane. Crack growth was recorded by time lapse photography. Subsequent measurement of the crack photographs gave crack size and shape changes as a function of elapsed cycles. A multidegree of freedom fracture mechanics model was developed to predict the growth of embedded surface and corner cracks located at open holes in plates loaded in remote tension. Crack growth predictions gave excellent agreement for the embedded surface crack plate results obtained under the current effort and also gave good results for corner cracked hole tests conducted under an earlier program. GRA

N84-10623# Dreyfuss-Pellman Corp., Stamford, Conn. Dept. of Mechanical Engineering and Mechanics.
FRACTURE MECHANICS OF SUB-LAMINATE CRACKS Interim Report, 1 Sep. 1979 - 30 Sep. 1982
A. S. D. Wang and F. W. Crossman Oct. 1982 220 p refs
(Contract F49620-79-C-0206; AF Proj. 2307)
(AD-A130782; AFOSR-83-0594TR) Avail: NTIS HC A10/MF A01 CSCL 12/1

A monograph is presented which details the analysis and experiment on the mechanics of sub-laminate crack propagation in polymer-based composite laminates. The analytical approach is based on the energy release rate concept of the classical fracture mechanics, in conjunction with a numerical crack propagation simulation technique using finite elements. Main emphasis is placed on statically induced cracks, although fatigue induced cracks are also discussed. Author (GRA)

N84-10624# Weidlinger Associates, New York, N.Y.
THEORY OF VISCOPLASTIC SHELLS FOR DYNAMIC RESPONSE
R. S. Atkatsh, M. P. Bieniek, and I. S. Sandler 1 Jan. 1982 69 p refs
(Contract DNA001-81-C-0048; DNA Proj. Y99-QAXS)
(AD-A131272; DNA-TR-81-50) Avail: NTIS HC A04/MF A01 CSCL 13/13

Viscoplastic shell model is formulated which utilizes the shell membrane strains and curvatures as the kinematic variable and the shell stress resultants as the dynamic variables. The viscoplastic shell model combines the concept of Perzyna's viscoplastic constitutive equations with Bieniek's shell stress resultant formulation. The model is incorporated into the EPSA code for the analysis of shells in an acoustic medium subjected to dynamic loading which produce large elasto-viscoplastic deformations in the shell. Several examples are presented to exhibit the effect of material rate dependence upon structural response. GRA

N84-10625# Illinois Univ., Chicago.
SINGULARITIES AT THE TIP OF A CRACK NORMAL TO THE INTERFACE OF AN ANISOTROPIC LAYERED COMPOSITE Final Report, 1 Oct. 1981 - 30 Nov. 1982
T. C. T. Ting and P. H. Hoang May 1983 43 p refs
(Contract DAAG46-81-K-0086; DA Proj. 8H3-63304-D-215)
(AD-A131504; AMMRC-TR-83-28) Avail: NTIS HC A03/MF A01 CSCL 11/4

The order of stress singularities at the tip of a crack which is normal to and ends at an interface between two anisotropic elastic layers in a composite is studied. Assuming that the stress singularities have the form equations are derived for determining the order of singularities K. If the materials on both sides of the interface are identical, $K = 1/2$ is a root of multiplicity three each of which can be identified with the singularity due to, respectively, a symmetric tensile stress applied at infinity, an antisymmetric plane shear stress and an antiplane shear stress applied at infinity. When the materials on both sides of the interface are not the same, there are in general three distinct roots for K. Numerical examples for a typical high modulus graphite/epoxy and for a special T300/5208 graphite/epoxy show that k has three positive roots all of which are close to 1/2 for most combinations of ply-angles in the two materials. GRA

N84-10626# SRI International Corp., Menlo Park, Calif.
PREDICTION OF CRACK GROWTH AQUEOUS ENVIRONMENTS Annual Progress Report, 15 Apr. 1982 - 14 Apr. 1983
L. E. Eiselstein, M. C. H. McKubre, and R. D. Caligiuri Jun. 1983 38 p refs
(Contract N00014-82-K-0343; SRI Proj. PYU-4333)
(AD-A131485; APR-1) Avail: NTIS HC A03/MF A01 CSCL 20/11

This first annual progress report describes the current status of a research program to develop a predictive model for stress corrosion cracking and corrosion fatigue. Our approach is to simultaneously characterize the electrochemical and mechanical state of the crack during the failure process. GRA

N84-10627# Systems Science and Software, La Jolla, Calif.
NUMERICAL SIMULATION OF THE VELOCITY RECORDS FROM THE SRI GROUT SPHERES EXPERIMENT
N. Rimer and K. Lie 1 Sep. 1982 150 p refs
(Contract DNA001-82-C-0043)
(AD-A131267; DNA-TR-82-54; SSS-R-82-5580) Avail: NTIS HC A07/MF A01 CSCL 20/11

Spherically symmetric finite difference calculations are presented here which successfully simulate the particle velocity measurements from small scale grout spheres experiments and show that particle velocity measurements together with numerical simulations may be used to obtain dynamic material properties. In these experiments, 3/8 gm charges of PETN explosive are detonated in 11 in. diameter spheres of grout in a water tank which simulates overburden. Numerical simulations are presented for experiments in two types of grout, 2C4 rock-matching grout and a high-porosity, low-density grout, LD2C4. Successful matches to the particle velocity pulses are obtained for each grout using two very different numerical constitutive models, a strain rate and shock damage (the RDD model) and the rate independent effective stress model. For 2C4 grout, the simulations involve primarily changes in the laboratory measured static failure surface to account for increases in the strength during shock loading and decreases in the strength on unload. For LD2C4 grout, the simulations involve primarily backing out a loading (air void crushup) curve from the particle velocity measurement. Small changes in this curve at pressures below 0.25 Kb are shown to cause large variations in the calculated peak particle velocities and in the pulse shape. A later laboratory measurement of this crush curve is shown to be in excellent agreement with the crush curve derived from the particle velocity measurements. Author (GRA)

N84-10628# Sandia Labs., Albuquerque, N. Mex.
MICROSTRUCTURAL EFFECTS ON WAVE PROPAGATION IN SOLIDS
Dennis E. Grady 1983 9 p refs Presented at the Workshop on Media with Microstructure and Wave Propagation, Houghton, Mich., 24 Jan. 1983
(Contract DE-AC04-76DP-000789)

(DE83-012609; SAND-83-1124C; CONF-830141-2) Avail: NTIS HC A02/MF A01

Two microstructural phenomena appear important in controlling the evolution of large amplitude stress waves in solids. First is the inherent microstructure of the material which leads to local stress concentration during passage of the wave and influences first order moduli through yielding, fracture, or phase transformation. Second is the evolution of microstructure during stress wave deformation through heterogeneous yielding and flow. The first phenomenon appears to dominate behavior in stress waves on the order of the material strength while the second phenomenon becomes increasingly important at higher stress levels. Careful stress-wave experiments combined in some cases with pre- and post-shock microstructural analysis illustrate the effects. Studies on certain geological materials have revealed that microstructural effects coupled with nonhydrostatic stress wave loading leads to complicated wave propagation, including wave separation and rarefaction shocks. Further shock wave work on metals and insulating solids indicates that a heterogeneous dynamic thermal and deformational microstructure controls shock transformation process and leads to unusual and useful changes in physical and mechanical properties. DOE

N84-10629# Naval Ship Research and Development Center, Annapolis, Md.

EXPERIMENTAL INVESTIGATION OF TEARING-INSTABILITY PHENOMENA FOR STRUCTURAL MATERIALS

M. G. Vassilaros, J. P. Gudas, and J. A. Joyce (Naval Academy) Aug. 1982 45 p refs

(DE83-900676; NUREG/CR-2570-Rev-1) Avail: NTIS HC A03/MF A01

The range of tearing instability validation experiments utilizing the compact specimen to include high toughness alloys was investigated. J-integral tests of ASTM A106; ASTM A516, Grade 70; ASTM A533B; HY-80; and HY-130 steels were performed in a variably compliant screw driven test machine. Results were analyzed with respect to the materials J sub I-R curves and various models ot T sub applied for the compact specimen. Tearing instability theory was validated for these high toughness materials. For the cases of highly curved J sub I-R curves, it was shown that the actual value of T sub material at the point of instability should be employed rather than the average T sub material value. DOE

N84-10630# General Electric Co., Schenectady, N. Y.

ENVIRONMENTAL CRACK-GROWTH-MEASUREMENT TECHNIQUES Final Report

T. A. Prater, W. R. Catlin, and L. F. Coffin Nov. 1982 78 p Sponsored by EPRI

(EPRI Proj. 2006-3)

(DE83-900734; EPRI-NP-2641) Avail: NTIS HC A05/MF A02

The feasibility of measuring both crack growth rates and shapes were demonstrated for part through cracks growing in carbon, alloy, and stainless steel specimens under uniaxial cyclic and static stresses in oxygenated 288 C, (550 F) water. Using a novel reversing dc electrical potential technique, microvolt level outputs from probe pairs located near variously shaped EDM thumbnail defects 0.64 mm (0.025 inch) deep were combined with a computer program to determine the best fit crack size and shape during growth. Stability and minimal scatter were achieved by averaging large numbers of observations to obtain each reading. Observed and calculated crack dimensions were in good agreement. This was demonstrated additionally for probes and defects located on the interior surface of a 4 inch diameter pipe, in oxygenated 249 C (480 F) water. The depth to surface length of the growing crack rapidly assumed a value of somewhat under 0.5. Single probe pairs can be used for this starting aspect ratio, but multiple probe pairs are recommended for smaller starting aspects ratios. Preliminary evidence suggested that surface crack growth rates in uniaxially loaded specimens were greater than those found in compact type test specimens for comparable conditions. Secondary cracking, initiating largely from probes remote to the defect, proved troublesome. Specimens modification to eliminate this problem is suggested. GRA

N84-10631# Los Alamos Scientific Lab., N. Mex.

FACTORS AFFECTING PLASTIC INSTABILITY AND SHEET FORMABILITY

S. S. Hecker 1982 11 p refs Presented at the 4th Intern. Conf. on Mech. Behavior of Mater., Stockholm, 15-19 Aug. 1983 (Contract W-7405-eng-36)

(DE83-011146; LA-UR-83-1174; CONF-830832-1) Avail: NTIS HC A02/MF A01

The strong influence of geometry and materials properties on plastic instability and sheet formability is illustrated with several experimental observations. Geometry (shape) of the specimen or work piece and the evolution of shape with deformation is of great importance. Experiments on sheet and thin walled tubes have demonstrated convincingly that sheets stretched over a punch are more stable than sheets stretched in plane; which, in turn, are more stable than expanded thin walled tubes. All can be explained by the specific interaction of specimen shape with loads and deformations. The materials parameters of greatest importance, are strain hardening, strain rate sensitivity, and plastic anisotropy. Several experiments are cited that demonstrate the importance of stress state, large strains, and path changes on the strain hardening response and on subsequent stability. DOE

N84-10632# Argonne National Lab., Ill.

BLUNT-CRACK BAND PROPAGATION IN FINITE-ELEMENT ANALYSIS FOR CONCRETE STRUCTURES

P. A. Pfeiffer, Z. P. Bazant, and A. H. Marchertas 1983 11 p refs Presented at the 7th Intern. Conf. on Struct. Mech. in Reactor Technol., Chicago, 22 Aug. 1983

(Contract W-31-109-eng-38)

(DE83-010726; CONF-830805-31) Avail: NTIS HC A02/MF A01

The knowledge of concrete fracture is needed in nuclear reactor safety. The question of safety arises from the potential of concrete to crack under thermal loading. It has been postulated that structural concrete could be exposed to very high temperature, which may result from hot reactor coolant or even core debris coming in direct contact with the concrete. The utilization of the blunt crack approach for simulating concrete cracking in a general purpose code is explored. The difficulties encountered in establishing the proper direction of crack propagation in an arbitrary discretization are described. Crack propagation is considered within the context of two types of solution techniques: (1) implicit solution of the static crack advance, and (2) explicit time integration using a dynamic relaxation technique to simulate the static crack advance. Also, in both solution techniques an elastic model is used to characterize the concrete. DOE

N84-10633# Ames Lab., Iowa.

SIMULATION OF CLOSURE: EFFECTS ON CRACK DETECTION PROBABILITY AND STRESS DISTRIBUTIONS

O. Buck, B. J. Skillings, and L. K. Reed 1983 9 p refs Presented at the Conf. on Quantitative NDE, Santa Cruz, Calif., 7 Aug. 1983 (Contract W-7405-eng-82)

(DE83-009309; IS-M-401; CONF-830811-1) Avail: NTIS HC A02/MF A01

It is well known that partial contact of two rough crack surfaces will lead to transmission of an acoustic signal across the crack, thus giving rise to a reduced probability of detection (POD). To explore the effects and consequences of such partial contact, impression experiments - using small spheres - have been performed to determine the effects of contact area on the amplitude transmitted. Based on the experimental results it is speculated stress field responsible for the crack closure may be calculated based on a determinaton of the size and separation of the contact areas. DOE

N84-10634# California Univ., Livermore. Lawrence Livermore Lab.

FEASIBILITY OF USING SONIC TECHNIQUES TO ESTIMATE IN-SITU STRESSES

N. Mao, J. Sweeney, J. Hanson, and M. Costantino 1 Jun. 1983 55 p refs
(Contract W-7405-eng-48)
(DE83-016890; UCRL-53424) Avail: NTIS HC A04/MF A01

This report presents the results of a three-year research effort to develop a technique for estimating in situ stresses by measuring stress-induced velocity anisotropy around a borehole. Relevant parameters required to make the estimate were identified and measured in the laboratory on a 35.6-cm cube of Nugget sandstone with a 10.2-cm diameter hole, under biaxial loading. The major technical obstacle to this study was the design of a transducer system for generating radially and tangentially polarized shear waves in a borehole configuration; the final design utilized a transducer/wedge assembly to generate refracted waves. Two pairs each of radially and tangentially polarized transducers were placed inside the 10.2-cm hole with displacement directions either parallel or perpendicular to the principal stress directions. With this configuration, relative travel times were measured by both a pulsed phase-locked loop technique and a cross correlation of digitized waveforms. Results from each technique show very good agreement, which indicates the validity of the approach. The uncertainty of timing was about 0.03 (SIGMA)s for an individual file. DOE

N84-10635# Los Alamos Scientific Lab., N. Mex.
CREEP AND THERMAL EFFECTS IN AGING SOLIDS
C. A. Anderson 1983 38 p refs Presented at the Intern. Union of Theoret. and Appl. Mech. Conf., Evanston, Ill., 11-15 Sep. 1983
(Contract W-7405-eng-36)
(DE83-012673; LA-UR-83-1379; CONF-830975-1) Avail: NTIS HC A03/MF A01

Three constitutive models that were developed for rocks, concrete and filled polymers to represent creep, thermal, stress, and aging effects are described. Also described are how these constitutive models are being used to numerically predict the behavior of solids in such diverse situations as aging creep of concrete structures and creeping mantle convection. In all cases low strain rate, compressive material behavior is the main interest. DOE

N84-10636# Hanford Engineering Development Lab., Richland, Wash.
FRACTURE BEHAVIOR OF UNIRRADIATED HT-9 AND MODIFIED 9Cr-1Mo WELDS
F. H. Huang and D. S. Gelles May 1983 25 p refs Presented at the TMS/AIME Topical Conf. on Ferritic Alloys for Use in Nucl. Energy Technol., Snowbird, Utah, 19-23 Jun. 1983
(Contract DE-AC06-76FP-02170)
(DE83-016021; HEDL-SA-2776-FP; CONF-830659-6) Avail: NTIS HC A02/MF A01

Fracture toughness tests on HT-9 weld and HAZ samples and modified 9Cr-1Mo weld samples were performed at 93, 205, 427 and 5380C. Specimens were of circular compact tension type fabricated from welded material with the notch orientation parallel to the fusion line. The test results were analyzed using the J-integral approach. The results demonstrated that the toughness of HT-9 and 9Cr-1Mo was not significantly reduced due to welding. However, the tearing modulus of the welded material was lower than that of base metal, indicating that the alloys become less resistant to crack propagation as a result of welding. DOE

N84-10637# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
STATISTICAL CRACK MECHANICS
John K. Dienes 1983 21 p refs Presented at the Coll. Intern. du CNRS N/Degree/351 Failure Criteria of Structured Media, Villard-de-Lans, France, 21-24 Jun. 1983
(Contract W-7405-eng-36)
(DE83-014124; LA-UR-83-1705; CONF-830679-1) Avail: NTIS HC A02/MF A01

An alternative to the use of plasticity theory to characterize the inelastic behavior of solids is to represent the flaws by statistical methods. By considering the effects of flaws, it becomes possible to address the underlying physics directly. It is explained why rocks exhibit large strain-rate effects (a consequence of the finite growth rate of cracks), why a spherical explosive imbedded in oil shale produces a cavity with a nearly square section (opening of bedding cracks) and why propellants may detonate following low speed impact (a consequence of frictional hot spots). DOE

N84-10638# United Kingdom Atomic Energy Authority, Harwell (England). Metallurgy Div.
THE EFFECTS OF SPECIMEN SIZE, SPECIMEN GEOMETRY AND DATA ANALYSIS PROCEDURES ON DUCTILE CRACK GROWTH RESISTANCE CURVES
G. P. Gibson and S. G. Druce Apr. 1983 30 p refs
(AERE-R-10906) Avail: NTIS HC A03/MF A01

The effect of specimen size and geometry on the onset of ductile tearing and the initial slope of J and crack opening displacement and resistance curves was investigated for a C-Mn steel. The results indicate that in plane sided specimens a thickness in excess of that specified in ASTM E813 is required to achieve a lower bound, or plane strain, J sub i value. However, the resultant decrease in J sub i is relatively small. Side grooving was found to be very effective in promoting plane strain conditions in subsized specimens. The initial tearing resistance was found to be markedly influenced by specimen thickness and degree of side grooving and the results indicate that achieving plane strain conditions in the proximity of the crack tip does not ensure a unique J-R curve in side grooved specimens. J sub IC values obtained using ASTM E813 were found to overestimate the 'true' values for C-Mn steel and a pressure vessel steel. This arises from the linear representation of the R curve and the assumed blunting line behavior. A power law equation was found to give a statistically better fit to the J-delta a data, particularly in high toughness materials. S.L.

42 GEOSCIENCES (GENERAL)

N84-10639# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
ATMOSPHERIC SCIENCES DIVISION Annual Report, Fiscal Year 1982
Paul Michael and Gilbert S. Raynor, ed. Dec. 1982 147 p refs
(Contract DE-AC02-76CH-00016)
(DE83-014429; BNL-33159) Avail: NTIS HC A07/MF A01

The research activities of the Atmospheric Sciences Division of the Department of Energy and Environment for FY 1982 are presented. Facilities and major items of equipment are described. Research programs are summarized in three categories, modeling, field and laboratory experiments and data management and analysis. Each program is also described individually with title, principal investigator, sponsor and funding levels for FY 1982 and FY 1983. Future plans are summarized. Publications for FY 1982 are listed with abstracts. A list of personnel is included. DOE

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-10640 Kansas Univ., Lawrence.
MICROWAVE RADIOMETRIC SENSITIVITY TO SOIL MOISTURE UNDER VEGETATION COVER Ph.D. Thesis
Mohammad Razani 1982 205 p
Avail: Univ. Microfilms Order No. DA8303911

The presence of a vegetation layer on top of a soil surface causes the level of emission intensity to increase, thereby decreasing the radiometric sensitivity to soil moisture variations.

This phenomenon is due partly to the screening of soil emission by the vegetation layer and partly to the inherent emission of radiation from the vegetation layer itself. The effect of the vegetation cover on the radiometric sensitivity to soil moisture is studied both theoretically and experimentally. Theoretically, the dielectric properties of the vegetation cover were studied and mixing formulas were established, then a simple radiative transfer model was employed and extended to improve the understanding of the vegetation effect on soil-moisture sensing. Experimentally, the airborne data from the 1978 Colby experiment were analyzed. The test site consisted of bare soil, wheat stubble, and fully mature corn fields. The results of corn indicate that the radiometric sensitivity to soil moisture decreases in magnitude. Dissert. Abstr.

N84-10641*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE EFFECTS OF SOLAR INCIDENCE ANGLE OVER DIGITAL PROCESSING OF LANDSAT DATA

Nelson de Jesus Parada, Principal Investigator and Evlyn M. L. M. Novo Sep. 1983 12 p refs Presented at the 17th Intern. Symp. on Remote Sensing of Environ., Ann Arbor, Mich., 9-13 May 1983 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E84-10007; NASA-CR-174522; NAS 1.26:174522; INPE-2867-PRE/401) Avail: NTIS HC A02/MF A01 CSCL 04A

A technique to extract the topography modulation component from digital data is described. The enhancement process is based on the fact that the pixel contains two types of information: (1) reflectance variation due to the target; (2) reflectance variation due to the topography. In order to enhance the signal variation due to topography, the technique recommends the extraction from original LANDSAT data of the component resulting from target reflectance. Considering that the role of topographic modulation over the pixel information will vary with solar incidence angle, the results of this technique of digital processing will differ from one season to another, mainly in highly dissected topography. In this context, the effects of solar incidence angle over the topographic modulation technique were evaluated. Two sets of MSS/LANDSAT data, with solar elevation angles varying from 22 to 41 deg were selected to implement the digital processing at the Image-100 System. A secondary watershed (Rio Bocaina) draining into Rio Paraiba do Sul (Sao Paulo State) was selected as a test site. The results showed that the technique used was more appropriate to MSS data acquired under higher Sun elevation angles. Topographic modulation components applied to low Sun elevation angles lessens rather than enhances topography. M.G.

N84-10642*# Environmental Research Inst. of Michigan, Ann Arbor.

AN ANALYSIS OF SPECTRAL DISCRIMINATION BETWEEN CORN AND SOYBEANS USING A ROW CROP REFLECTANCE MODEL

Gwynn H. Suits 1983 20 p refs ERTS

(Grant NAG5-83)

(E84-10008; NASA-CR-174523; NAS 1.26:174523; ERIM-166500-1-L) Avail: NTIS HC A02/MF A01 CSCL 02C

Reflectence calculations of soybeans and corn crops at two times during the growing season indicate that the high sensitivity of the thematic mapper mid-infrared band to exposed bare soil between soybean rows is most likely responsible for early season spectral discrimination of corn and soybean crops by this band. Author

N84-10643*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

RADAR REMOTE SENSING FOR CROP CLASSIFICATION AND CANOPY CONDITION ASSESSMENT: GROUND-DATA DOCUMENTATION

Fawwaz T. Ulaby, Principal Investigator, B. Jung, K. Gillespie, M. Hemmat, A. Aslam, D. Brunfeldt, and M. Dobson Apr. 1983 252 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development

(Contract NCC9-4; Proj. AgRISTARS)

(E84-10020; NASA-CR-171702; SR-K3-04424; NAS 1.26:171702; RLS-TR-580-2) Avail: NTIS HC A12/MF A01 CSCL 02C

A vegetation and soil-moisture experiment was conducted in order to examine the microwave emission and backscattering from vegetation canopies and soils. The data-acquisition methodology used in conjunction with the mobile radar scatterometer (MRS) systems is described and associated ground-truth data are documented. Test fields were located in the Kansas River floodplain north of Lawrence, Kansas. Ten fields each of wheat, corn, and soybeans were monitored over the greater part of their growing seasons. The tabulated data summarize measurements made by the sensor systems and represent target characteristics. Target parameters describing the vegetation and soil characteristics include plant moisture, density, height, and growth stage, as well as soil moisture and soil-bulk density. Complete listings of pertinent crop-canopy and soil measurements are given. M.G.

N84-10644*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

EVALUATION OF LANDSAT-4 TM AND MSS GROUND GEOMETRY PERFORMANCE WITHOUT GROUND CONTROL Quarterly Progress Report

Nevin A. Bryant and Albert Zobrist 11 Oct. 1983 4 p ERTS

(Contract NAS7-918)

(E84-10022; NASA-CR-174546; NAS 1.26:174546) Avail: NTIS HC A02/MF A01 CSCL 05B

LANDSAT thematic mapper P-data of Washington, D.C., Harrisburg, PA, and Salton Sea, CA were analyzed to determine magnitudes and causes of error in the geometric conformity of the data to known earth-surface geometry. Several tests of data geometry were performed. Intra-band and inter-band correlation and registration were investigated, exclusive of map-based ground truth. Specifically, the magnitudes and statistical trends of pixel offsets between a single band's mirror scans (due to processing procedures) were computed, and the inter-band integrity of registration was analyzed. M.G.

N84-10645*# Washington Univ., St. Louis, Mo. Center for the Space Sciences.

STRUCTURE OF THE SAINT FRANCOIS MOUNTAINS AND SURROUNDING LEAD BELT, SOUTH EAST MISSOURI: INFERENCES FROM THERMAL IR AND OTHER DATA SETS Final Report

Raymond E. Arvidson, Principal Investigator, Edward A. Guinness, and Duane L. Bindschadler Apr. 1983 78 p refs Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM

(Contract NAS5-26533)

(E84-10027; NASA-CR-170591; NAS 1.26:170591) Avail: NTIS HC A05/MF A01 CSCL 05B

Several digital data sets were registered to a common base map for southern Missouri. These registered data sets were examined in an attempt to improve our understanding of the crustal structure and the relationships between structure and Pb-Zn-Cu, Fe, Mn, and Ba ores in the area. Data included land station reading of gravity, geologic data, and Heat Capacity Mapping Mission (HCMM) images. The HCMM day infrared (IR) images of Missouri displayed linear features, which parallel a newly discovered NW-SE trending Bouguer gravity low. The structural pattern over the gravity low suggests vertical uplift of the low density crust via isostatic readjustment and consequent fracturing of the Paleozoic sedimentary cover. The presence of a gravity low is interesting because rifts are often sites of extensive mineralization. The HCMM thermal data were also examined in conjunction with digital topography, land use, and LANDSAT MSS data to understand the phenomena that produce linears on the HCMM day IR images. Finally, the kinds of information that can be extracted from day-night IR pairs are discussed. M.G.

N84-10646*# Virginia Polytechnic Inst. and State Univ., Blacksburg. School of Forestry and Wildlife Resources.
UPDATE AND REVIEW OF ACCURACY ASSESSMENT TECHNIQUES FOR REMOTELY SENSED DATA Final Report
Russell G. Congalton, Joel T. Heinen, and Richard G. Oderwald Jan. 1983 41 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E84-10029; NASA-CR-171703; RR-U3-04435; NAS 1.26:171703; USDAES-83-NFAP-327; RRR-83-1) Avail: NTIS HC A03/MF A01 CSCL 02C

Research performed in the accuracy assessment of remotely sensed data is updated and reviewed. The use of discrete multivariate analysis techniques for the assessment of error matrices, the use of computer simulation for assessing various sampling strategies, and an investigation of spatial autocorrelation techniques are examined. Author

N84-10647*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Renewable Resources Dept.
AGRISTARS DOCUMENTS TRACKING LIST REPORT
J. L. Hawkins 17 Oct. 1983 107 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E84-10030; NASA-CR-171704; AP-L3-04416; JSC-18887; NAS 1.26:171704; LEMSCO-19557) Avail: NTIS HC A06/MF A01 CSCL 02C

A quarterly listing of documents issued and placed in the AgRISTARS tracking system is provided. The technical publications are arranged by type of documents. The reference AgRISTARS document number, title and date of publication, the issuing organization, and the National Technical Information Service reference number is given. A.R.H.

N84-10648*# Science Applications, Inc., Dayton, Ohio.
A STOCHASTIC ATMOSPHERIC MODEL FOR REMOTE SENSING APPLICATIONS Final Report, 1 Jul. 1982 - 1 Jul. 1983
Robert E. Turner Aug. 1983 33 p refs
(Contract NAS1-17006)
(NASA-CR-172181; NAS 1.26:172181; SAI-83-002-DAY) Avail: NTIS HC A03/MF A01 CSCL 05B

There are many factors which reduce the accuracy of classification of objects in the satellite remote sensing of Earth's surface. One important factor is the variability in the scattering and absorptive properties of the atmospheric components such as particulates and the variable gases. For multispectral remote sensing of the Earth's surface in the visible and infrared parts of the spectrum the atmospheric particulates are a major source of variability in the received signal. It is difficult to design a sensor which will determine the unknown atmospheric components by remote sensing methods, at least to the accuracy needed for multispectral classification. The problem of spatial and temporal variations in the atmospheric quantities which can affect the measured radiances are examined. A method based upon the stochastic nature of the atmospheric components was developed, and, using actual data the statistical parameters needed for inclusion into a radiometric model was generated. Methods are then described for an improved correction of radiances. These algorithms will then result in a more accurate and consistent classification procedure. Author

N84-10649# Synectics Corp., Rome, N. Y.
INTERACTIVE RASTER DATA STRUCTURE STUDY Final Technical Report, 10 Nov. 1981 - 10 Nov. 1982
David R. Gallauresi, James R. Muller, R. Patrick OConnor, and David A. Kolassa Griffiss AFB, N.Y. RADC Jan. 1983 286 p refs
(Contract F30602-81-C-0279; AF Proj. 4594)
(AD-A130195; RADC-TR-83-12) Avail: NTIS HC A13/MF A01 CSCL 09/2

This report describes a study conducted to define current capabilities for interactive processing of raster structured cartographic data and to identify potential techniques for future enhancement of those capabilities. Past raster processing development activities are summarized and current concepts are described. Data structures are recommended to increase computational efficiency of various cartographic functions associated with the production and exploitation of topological data. A system hardware and software concept is suggested to support future requirement for a complete raster compilation and revision capability. Author (GRA)

N84-10650# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
MAPPING, CHARTING AND GEODESY AT THE DEFENSE MAPPING AGENCY
Robert H. Hall May 1983 12 p Presented at the Ann. Cartotechniques III Conf.; sponsored by the Ontario Inst. of Chartered Carographers and the Canadian Inst. of Surveying
(AD-A130344) Avail: NTIS HC A02/MF A01 CSCL 08/2

This paper provides an overview of mapping, charting, and geodesy programs at the Defense Mapping Agency. Conventional maps and charts along with special products are covered. Special emphasis is placed on current and future digital data programs, processes, and equipment. Future programs including equipment, techniques, and computer assisted cartography are covered. Author (GRA)

N84-10651# Analytic Sciences Corp., Reading, Mass.
ASSESSMENT OF MEANS FOR DETERMINING DEFLECTION OF THE VERTICAL Interim Technical Report, 1 Dec. 1981 - 31 May 1982
W. G. Heller, A. R. leSchack, and S. F. Cushman Fort Belvoir, Va. Army Engineer Topographic Labs. Aug. 1982 211 p refs
(Contract DAAK70-82-C-0011; DA Proj. 4A7-62707-AF-55)
(AD-A131286; TASC-TR-4051-1; ETL-0303) Avail: NTIS HC A10/MF A01 CSCL 08/5

This Interim Technical Report documents the first phase of a study of methods for determining deflections of the vertical. In this phase, the astrogeodetic and gravimetric methods have been examined. The objectives of these investigations have been: assessment of the accuracy of alternative astrogeodetic procedures; identification and analysis of potential improvements in astrogeodetic instrumentation; documentation of the gravimetric method and identification of achievable accuracy; development of error models for astrogeodetic and gravimetric techniques. The second phase of this program will address techniques for determining deflections of the vertical from combinations of astrogeodetic, gravimetric, inertial, and gradiometric techniques. Author (GRA)

N84-10652# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
MULTI-TEMPORAL ANALYSIS OF LANDSAT IMAGERY FOR BATHYMETRY Final Report, 6 Jun. 1981 - 30 Sep. 1982
Fred J. Tanis, Ross Hieber, and Fred J. Thomson May 1983 101 p refs
(Contract N00014-81-C-2334)
(AD-A130648; ERIM-155500-2-F) Avail: NTIS HC A06/MF A01 CSCL 08/10

A multi-temporal processing procedure has been developed for the Defense Mapping Agency/HTC Digital Image Processing System (DIPS). The purpose of this procedure is to extract hydrographic information from multi-data LANDSAT and other types of remote sensing data. Water depth variations from multiple remote sensing observations can be analyzed to identify the sources of variations. When such variations can be removed from the data the multi-temporal data set can yield an improved estimate of water depth. Six available LANDSAT scene dates had been previously processed to provide an independent set of predicted water depths for the Bahamas Photobathymetric Calibration Area. Geographical locations of ship survey soundings were used to extract pixel locations from the six registered scene dates. Relationships between these predicted water depths and the measured depths were analyzed using standard statistical methods. Results aided the development of processing procedures and a

best estimator of water depth for LANDSAT multi-temporal data. Multi-temporal processing (MTP) software was written to perform similar operations on the DIPS. Preprocessing steps are suggested to remove unwanted spatial noise from multi-date LANDSAT data. Author (GRA)

N84-10653# Defense Mapping Agency, Washington, D.C.
STATUS OF AUTO CARTO AT THE DEFENSE MAPPING AGENCY
F. C. Green Jun. 1983 7 p
(AD-A131235) Avail: NTIS HC A02/MF A01 CSCL 08/2

During the last year, DMA has focused on increased utilization of auto carto techniques and processes in production. Although significant auto carto capabilities have existed in the past, a combination of a balancing of production emphasis and software development is now providing increased automation in map and chart production. Discussed are developments in exploiting digital product data for maps and charts and the family of products concept. Applications of scale conversion through digital processes using existing repromat source for smaller scale maps are reviewed. New applications of auto carto scheduled for integration into production in the near future are also discussed. Author (GRA)

N84-10654# Oak Ridge National Lab., Tenn.
CARBON IN LIVE VEGETATION OF MAJOR WORLD ECOSYSTEMS
J. S. Olson, J. A. Watts, and L. J. Allison Jun. 1983 191 p refs
(Contract W-7405-eng-26)
(DE83-015328; DOE/NBB-0037) Avail: NTIS HC A09/MF A01

A computerized data base was developed to make a seven color global ecology map of 44 land ecosystem mosaics or subdivisions in seven broad groups. This computer-based global map of vegetation and carbon density for natural and modified complexes of ecosystems is documented and some human influences on the global carbon illustrated cycle. The map provides a basis for making improved estimates of vegetation areas and carbon quantities, of natural biological exchanges of CO2, and eventually of the net historic shifts of cabon between the biosphere and the atmosphere. Estimates of biomass in reees and total carbon in live plants per unit area are tabulated. The results help define the role of the terrestrial biosphere in the global carbon cycle. Results also imply major historic reductions of global carbon for broad regions and most vegetation types. Lowered estimates of carbon due to forest harvest or clearing for crops in the last century imply lowered estimates of input of nonfossil CO2 to the atmosphere. DOE

N84-10655# Idaho Univ., Moscow.
HYDROLOGIC FLOW DETERMINATION FOR HYDROPOWER FEASIBILITY ANALYSIS
J. R. Filler and C. C. Warnick Dec. 1982 48 p refs
(Grant DI-14-34-0001-2114)
(PB83-219758; ORT-1-068-IDA(2); W83-03271) Avail: NTIS HC A03/MF A01 CSCL 08H

A study was made of methods for determining average annual runoff from ungaged watersheds and the use of such runoff in the estimation of flow duration curves for hydropower feasibility studies. Methods included the use of precipitation-input maps, water yield maps, and regression equations utilizing basin characteristics. The various methods were tested on gaged and ungaged watersheds in Idaho and results compared with each other, as well as with actual flow measurements. The use of watershed characteristics such as mean basin elevation, cover density, and annual precipitation were tested and compared and it was found that precipitation alone provided the best and simplest approach for determining runoff. Author (GRA)

N84-10656# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Glaciology of the Polar Research Board.
SNOW AND ICE RESEARCH: AN ASSESSMENT
1983 146 p refs
(Grant NSF DPP-82-07098)
(PB83-231662) Avail: NTIS HC A07/MF A01 CSCL 08L

Glaciology is the study of ice in all its naturally occurring forms. The report summarizes progress in this field over the past decade, identifies needed research on physical properties of ice, seasonal snow, floating ice, glaciers, and other research needs. Recommendations deal with the interaction of snow and ice with past and present climate, and the direct impact of snow and ice on society. GRA

N84-10657# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
GEOPHYSICAL FLUID DYNAMICS LABORATORY ACTIVITIES FY1982, PLANS-FY1983
Sep. 1982 142 p
(PB83-232827; NOAA-83071406) Avail: NTIS HC A07/MF A01 CSCL 08H

The scientific understanding of those physical processes which govern the behavior of the atmosphere and the oceans as complex fluid systems is expanded. These fluids can then be modeled mathematically and their phenomenology studied by computer simulation methods. The scientific work encompasses a variety of disciplines: meteorology, oceanography, hydrology, classical physics, fluid dynamics, chemistry, applied mathematics, high-speed digital computation, and experimental design and analysis. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-10658 Clemson Univ., S.C.
AN INVESTIGATION OF THERMAL CHARACTERISTICS OF PLATE-IN-TUBE SOLAR RECEIVERS Ph.D. Thesis
Parm Pal Singh 1982 177 p
Avail: Univ. Microfilms Order No. DA8306273

The overall objective of this investigation was to examine the characteristics of plate in tube solar receivers which affect the collection efficiency. A stationary internal circular cylindrical concentrator was analyzed to determine the theoretical concentration ratio, effective concentration ratio and flux distribution on a T-shaped receiver as a function of acceptance angle, receiver configuration and reflectivity of the reflector. The theoretical concentration ratio decreased from 1.8 to 1.2 for an increase in acceptance angle from 3 to 17 degrees. The configuration of the T-shaped receiver for maximum average concentration ratio changes with acceptance angle. For higher concentration ratios, a new concentrator design consisting of that reflector panels and capable of providing uniform flux distribution on a flat receiver was developed. Four configurations of the reflector receiver combination were considered. The back lighted vertical receiver configuration was found to be best. It can give theoretical concentration ratio of up to 30 with L/D ratio of less than 1.1. Dissert. Abstr.

N84-10659# Department of Energy, Washington, D. C. Office of Computer Services and Telecommunications Management.
ASSOCIATION FOR ENERGY SYSTEMS, OPERATIONS AND PROGRAMMING (AESOP) TOPICAL CONFERENCE SUMMARY OF PROCEEDINGS
1982 401 p Conf. held in Springfield, Va., 29-30 Sep. 1982
(CONF-820986-SUMM) Avail: NTIS HC A18/MF A01

A tutorial overview of local area networks covered the motivation, applications, and requirements for using local area networks. Briefings from vendors who market various products in

support of local area networks are provided. The status and the future direction of baseband, broadband, and other technologies were discussed. An overview of local area network experiences and plans is provided. Industry and Department of Energy local area networks were explained. Author

N84-10660*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL ENERGY STORAGE EVALUATION AND LIFE TESTING Interim Report, May - Oct. 1981
Robert Richter Wright-Patterson AFB, Ohio AFWAL Jan. 1983 44 p refs
(Contract NAS7-100; AF Proj. 3145)
(NASA-CR-174464; NAS 1.26:174464; AD-A130356; AFWAL-TR-82-2117) Avail: NTIS HC A03/MF A01 CSCL 20/13

Two thermal energy storage (TES) units which were built under a previous contract were tested with a Hi-Cap Vuilleumier cryogenic cooler in the facility of the Hughes Aircraft Corporation. The objective of the program was the evaluation of the behavior of the TES units as well as the determination of the temperature history of the three cold stages of the Vuilleumier cryogenic cooler during cyclic charging and discharging of the TES units. The test results have confirmed that thermal energy storage can provide the necessary thermal power to the hot cylinders of the Vuilleumier cryogenic cooler at the required operating temperatures. Thereby the continuous cooling capability of the cooler during an eclipse when no electrical power is available is being assured. The cold stage temperature amplitudes during a complete charge discharge cycle of the TES units were only about 10% of the amplitudes which were observed when the Hi-Cap Vuilleumier cryogenic cooler was operating without thermal energy storage backup in a simulated orbit of 54 minutes sun exposure and 18 minutes eclipse time. The thermal conductivity of the molten thermal energy storage salt was apparently only a fraction of the thermal conductivity which had been assumed for the prediction of the upper heater temperatures. A redesign of the heater temperatures below 1480 degrees F which is now required for full charging of the TES units within 54 minutes with the present heater design. Author (GRA)

N84-10661*# University of Southern Illinois, Carbondale. Coll. of Engineering and Technology.
HOW TO PROTECT A WIND TURBINE FROM LIGHTNING Final Report
Curtis W. Dodd, Thomas McCalla, Jr., and James G. Wood Sep. 1983 111 p refs
(Contracts NCC3-7; DE-AI01-76ET-20320)
(NASA-CR-168229; DOE/NASA/0007-1; NAS 1.26:168229) Avail: NTIS HC A06/MF A01 CSCL 10A

Techniques for reducing the chances of lightning damage to wind turbines are discussed. The methods of providing a ground for a lightning strike are discussed. Then details are given on ways to protect electronic systems, generating and power equipment, blades, and mechanical components from direct and nearby lightning strikes. Author

N84-10662*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
HIGH EFFICIENCY, LOW COST THIN GaAs SOLAR CELLS Report, 1 Oct. 1981 - 30 Sep. 1982
John C. C. Fan 30 Sep. 1982 43 p refs
(Contract NAS-C-60878-D)
(NASA-CR-168265; NAS 1.26:168265) Avail: NTIS HC A03/MF A01 CSCL 10A

The feasibility of fabricating space-resistant, high efficiency, light-weight, low-cost GaAs shallow-homojunction solar cells for space application is demonstrated. This program addressed the optimal preparation of ultrathin GaAs single-crystal layers by AsCl3-GaAs-H2 and OMCVD process. Considerable progress has been made in both areas. Detailed studies on the AsCl3 process showed high-quality GaAs thin layers can be routinely grown. Later overgrowth of GaAs by OMCVD has been also observed and thin FaAs films were obtained from this process. Author

N84-10663*# Aerospace Corp., El Segundo, Calif. Government Support Operations.
ASSESSMENT OF THE ENVIRONMENTAL ASPECTS OF THE DOE PHOSPHORIC ACID FUEL CELL PROGRAM Final Report
Herbert L. Lundblad and Ronald R. Cavagrotti May 1983 188 p refs
(Contract DE-AI21-80ET-17088)
(NASA-CR-168131; DOE/NASA/2701-3; NAS 1.26:168131; ATR-83(3813-07)-1ND) Avail: NTIS HC A09/MF A01 CSCL 10B

The likely facets of a nationwide phosphoric acid fuel cell (PAFC) power plant commercial system are described. The beneficial and adverse environmental impacts produced by the system are assessed. Eleven specific system activities are characterized and evaluated. Also included is a review of fuel cell technology and a description of DOE's National Fuel Cell Program. Based on current and reasonably foreseeable PAFC characteristics, no environmental or energy impact factor was identified that would significantly inhibit the commercialization of PAFC power plant technology. Author

N84-10664*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXAMINATION, EVALUATION AND REPAIR OF LAMINATED WOOD BLADES AFTER SERVICE ON THE Mod-OA WIND TURBINE
James R. Faddoul 1983 46 p refs Presented at the Natl. Conf. of the American Wind Energy Association, San Francisco, 16-19 Oct. 1983
(Contract DE-AI01-79ET-20320)
(NASA-TM-83483; E-1805; DOE/NASA/20320-53; NAS 1.15:83483) Avail: NTIS HC A03/MF A01 CSCL 10A

Laminated wood blades were designed, fabricated, and installed on a 200-KW wind turbine (Mod-OA). The machine uses a two-blade rotor with a diameter of 38.1 m (125 ft). Each blade weights less than 1361 kg (3000 lb). After operating in the field, two blade sets were returned for inspection. One set had been in Hawaii for 17 months (7844 hr of operation) and the other had been at Block Island, Rhode Island, for 26 months (22 months operating - 7564 hr). The Hawaii set was returned because of one of the studs that holds the blade to the hub had failed. This was found to be caused by a combination of improper installation and inadequate corrosion protection. No other problems were found. The broken stud (along with four others that were badly corroded) was replaced and the blades are now in storage. The Block Island set of blades was returned at the completion of the test program, but one blade was found to have developed a crack in the leading edge along the entire span. This crack was found to be the result of a manufacturing process problem but was not structurally critical. When a load-deflection test was conducted on the cracked blade, the response was identical to that measured before installation. In general, the laminate quality of both blade sets was excellent. No significant internal delamination or structural defects were found in any blade. The stud bonding process requires close tolerance control and adequate corrosion protection, but studs can be removed and replaced without major problems. Moisture content stabilization does not appear to be a problem, and laminated wood blades are satisfactory for long-term operation on Mod-OA wind turbines. Author

N84-10665*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ECONOMIC COMPETITIVENESS OF FUEL CELL ONSITE INTEGRATED ENERGY SYSTEMS Final Report
Gary Bollenbacher Aug. 1983 69 p refs
(Contract DE-AI01-80ET-17088)
(NASA-TM-83403; E-1681; DOE/NASA/17088/4; NAS 1.15:83403) Avail: NTIS HC A04/MF A01 CSCL 10A

The economic competitiveness of fuel cell onsite integrated energy systems (OS/IES) in residential and commercial buildings is examined. The analysis is carried out for three different buildings with each building assumed to be at three geographic locations

spanning a range of climatic conditions. Numerous design options and operating strategies are evaluated and two economic criteria are used to measure economic performance. In general the results show that fuel cell OS/IES's are competitive in most regions of the country if the OS/IES is properly designed. The preferred design is grid connected, makes effective use of the fuel cell's thermal output, and has a fuel cell powerplant sized for the building's base electrical load. Author

N84-10666# Air-Equipement, Asnieres (France).
PROCEEDINGS OF THE UNITED STATES AIR FORCE AND TRI-SERVICE WIND ENERGY WORKSHOP AND CONFERENCE Final Report, Oct. 1980 - Sep. 1982
Thomas E. Kullgren Tyndall AFB, Fla. Air Force Engineering and Services Center Apr. 1983 191 p Conf. held at the Air Force Academy, Colo., 31 Aug. - 2 Sep. 1982
(AF Proj. 2054)
(AD-A130697; AFESC/ESL-TR-83-18) Avail: NTIS HC A09/MF A01 CSCL 10/2

This report serves as the proceedings of the USAF and Tri-Service Wind Energy Workshop and Conference held at the USAF Academy, 31 August - 2 September 1982. The purpose of this activity was to transfer technology for wind site surveying and wind machine applications to the major air command and individual base levels. In addition, presentations were made by DoD organizations planning for or actually operating wind machines to foster the interchange of information. Author (GRA)

N84-10667# Sanders and Thomas, Inc., Pottstown, Pa.
PRELIMINARY OPERATING ASSESSMENT ADVANCED HEAT RECOVERY INCINERATOR (HRI). SITE ONE: O'CONNOR COMBUSTOR CORPORATION Final Report for period ending Jan. 1983
Herbert I. Hollander, Gregory J. Matzuk, and Galen Romine Pt. Hueneme, Calif. NCEL Jul. 1983 35 p
(Contract N68305-80-C-0060)
(AD-A131254; NCEL-CR-83.028) Avail: NTIS HC A03/MF A01 CSCL 13/2

This brief evaluation of the first O'Connor (rotary waterwell) Combustor plant built in the U.S.A. describes design features and considerations as well as initial operating advantages and difficulties. A brief general description of a co-located, proprietary fuel preparation system is included. The major conclusion presented alludes to a waste fuel availability requirement approaching 60 tons per day (tpd) for probable cost-effectiveness of this technology. Author (GRA)

N84-10668# North Wind Power Co., Inc., Moretown, Vt.
NORTH WIND 4-KILOWATT WIND-SYSTEM DEVELOPMENT. PHASE 1: DESIGN AND ANALYSIS. VOLUME 1: EXECUTIVE SUMMARY
May 1982 20 p
(Contract DE-AC04-76DP-03533)
(DE83-012278; RFP-3424-1-Vol-1) Avail: NTIS HC A02/MF A01

Extensive design work was complimented by scale model testing of critical components and concepts, aimed at developing analytical tools, design guidelines, and experience for implementation on the full scale prototype, scheduled for fabrication and testing in Phase 2 of this contract. The advanced concepts employed in the soft rotor/control system and the electrical power generation scheme were designed, tested and verified. Design emphasis has been placed on reliability, safety, cost effectiveness and user acceptance. A summary of the analysis, testing and design conducted throughout Phase 1 is included. DOE

N84-10669# New York Univ., New York.
TORNADO WIND ENERGY CONVERSION SYSTEM (TWECS) EVALUATION PROGRAM Final Report
Gabriel Miller, Rudolph Wiley, Barry Liebowitz, and Harvey Brudner Sep. 1982 136 p refs Sponsored in part by New York Energy Research and Development Authority
(PB83-227207; NYSERDA-82-35) Avail: NTIS HC A07/MF A01 CSCL 10B

The study detailed in this report has three major components: The testing and optimization of TWECS wind tunnel models, the development of a realistic theoretical model of TWECS performance and the construction and field testing of a prototype TWECS. Wind tunnel testing with optimized TWECS models resulted in low power coefficients (below 3 percent). Similar results were also experienced under atmospheric tests with a large field prototype (30 feet high and 15 feet in diameter). Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-10670# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LASER REMOTE SENSING OF ATMOSPHERIC POLLUTANTS Final Report, 1 Oct. 1981 - 30 Sep. 1982
Dennis K. Killinger, Norman Menyuk, and Aram Mooradian 30 Sep. 1982 38 p refs
(Contract F19628-80-C-0002; AF Proj. 1900)
(AD-A130259; ESD-TR-83-018; AFESC/ESL-TR-83-029) Avail: NTIS HC A03/MF A01 CSCL 20/5

The specific tasks which were conducted during FY82 for this research program consisted of the following: (1) the initial development of a heterodyne-detection, differential-absorption LIDAR (DIAL) system, (2) the development of a computerized data acquisition and processing system for range-resolved, heterodyne-detection DIAL measurements, (3) preliminary range-resolved, heterodyne-detection DIAL measurements of atmospheric species, and (4) a study of the potential application of the continuously tunable Co:MgF2 IR laser for remote sensing of airfield pollutants and gaseous species. GRA

N84-10671# Oak Ridge National Lab., Tenn.
EFFECTS OF ACID PRECIPITATION AND NATURAL PROCESSES ON CATION LEACHING FROM 4 DIVERSE FOREST ECOSYSTEMS
Dale W. Johnson, Helga vanMiegroet (Washington Univ., Seattle), Dale W. Cole (Washington Univ., Seattle), and Daniel D. Richter 1983 31 p refs Presented at the 6th No. Am. Forest Soils Conf., Knoxville, Tenn., 19 Jun. 1983
(DE83-015759; CONF-830692-1) Avail: NTIS HC A03/MF A01

Four forest ecosystems (two in eastern Tennessee and two in western Washington) with a history of intensive nutrient cycling research were selected for studies on the effects or acid precipitation and natural acid production processes on cation leaching rates. At the Tennessee sites, atmospheric acid input in bulk precipitation equaled or exceeded natural leaching by carbonic acid. At the less polluted Washington sites, natural leaching by carbonic acid was slightly larger than atmospheric acid input in the Douglas fir soil. In the red alder soil, natural nitric acid formation far exceeded atmospheric acid inputs and appeared to have caused significant acidification of both soil and soil solution. The mobility of SO4(2+) and NO3(+) in these four soils was a major factor in their relative susceptabilities to leaching by H2SO4 and HNO3 entering from the atmosphere. In two of the sites (chestnut oak in Tennessee and red alder in Washington), SO4(2+) adsorption reduced the potential for sulfate mediated leaching by H2SO4 by as much as one half. Biological immobilization of NO3(+) prevented leaching in all but the N-fixing red alder site. DOE

N84-10672# Environmental Sciences Research Lab., Research Triangle Park, N.C.
ATLAS OF SOURCE EMISSION PARTICLES
John L. Miller Jun. 1983 45 p refs
(PB83-229013; EPA-600/3-83-041) Avail: NTIS HC A03/MF A01 CSCL 13B

An atlas of various source emission particles characterized by electron optical techniques was compiled for use by air pollution investigators. The particles studied were emitted by mobile,

stationary, and natural sources. Sources included automobiles, manufacturing operations, power plants, smelters, mining and quarring. Filter media and sample preparation methodology as well as morphological and chemical data are presented. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-10673 Michigan Univ., Ann Arbor.
CENTROID SCALING OF CITATION DATA: CHARTING THE HISTORY OF A SCIENTIFIC SPECIALTY, PLATE TECTONICS Ph.D. Thesis
Elliot Jason Noma 1982 159 p
Avail: Univ. Microfilms Order No. DA8304561

When a published article includes another article in its reference list its author expresses a conceptual link between the article and the article it cites. Based on this simple premise a method for scaling is developed. It is called centroid scaling. This method places articles as points into a Euclidean space. In this space articles connected by a citation link are drawn as close as possible to each other. Using this simple model of the citation bond, centroid scaling locates both citing and cited articles in a common space. The advantages of centroid scaling over previous methods, such as bibliographic coupling and co-citation is demonstrated. First, basing the method on a model of the citation bond permits parallel development of the scaling method and models of the citation bond. Second, the basic computational procedure can be implemented using subroutines that are generally available in most computer facilities. This method is applied to spatially locate 21 articles on plate tectonics according to the pattern of citations they received from 1971 to 1980. Dissert. Abstr.

N84-10674# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
EFFECTS OF APPROXIMATE RADIATION TREATMENTS USED IN THE CLIMATE MODELS ON THE CLEAR SKY THERMAL RADIATION FLUX AND ITS PERTURBATION DUE TO CO2 INCREASE
Wei-Chyung Wang Jan. 1983 42 p refs
(Contract DE-AC02-81ER-60023)
(DOE/ER-60023/1; TR002) Avail: NTIS HC A03/MF A01

The effects of approximate radiation treatments commonly adopted in the climate models on the calculated thermal radiation flux and its perturbation due to CO2 increase are assessed. The uncertainties in the calculated clear sky thermal flux associated with the approximations (Curtis-Godson and correlated-k methods) for inhomogeneous atmosphere, the use of exponential kernel (diffusivity factor) approximation, the treatment of model layer temperature (constant and linear Planck function), and the representation (narrow and wide band) for the correlation of spectral features between the overlapping gases and the Planck function are examined. The results indicate that for an inhomogeneous atmosphere the correlated-k method calculates nearly identical flux and flux perturbation as those computed based on the Curtis-Godson method. The results also suggest that the use of a diffusivity factor (1.66) to represent the zenith angle integration is appropriate for CO2 thermal radiation calculations. Author

N84-10675*# National Aeronautics and Space Administration, Washington, D. C.
THE NASA GEODYNAMICS PROGRAM: AN OVERVIEW
Jan. 1983 132 p refs
(NASA-TP-2147; NAS 1.60:2147) Avail: NTIS HC A07/MF A01 CSCL 08G

This NASA Geodynamics Program overview collectively examines the history, scientific basis, status, and results of the NASA Program and outlines plans for the next five to eight years. It is intended as an informative nontechnical discussion of geodynamics research. S.L.

N84-10676# Utah Univ., Salt Lake City.
STORMER EQUATION IMPLEMENTATION USING OFFSET DIPOLE COORDINATES DERIVED FROM SPECIFIED GEOGRAPHIC COORDINATES
David J. Cooke Hanscom AFB, Mass. AFGL Mar. 1983 15 p refs
(Contract F19628-81-K-0020; AF Proj. 2311)
(AD-A130079; Scientific-3; AFGL-TR-83-0102) Avail: NTIS HC A02/MF A01 CSCL 04/1

For many purposes it is useful to have a fast means of estimating directional cosmic ray cutoffs pertaining to any specified direction and location. The Stormer equation offers a means of determining directional cutoffs to a precision suitable for use in non-critical applications, at a speed many orders of magnitude faster than the process of determining precise cutoffs by the real geomagnetic field trajectory tracing method. Use of offset dipole coordinates in the Stormer equation allows minimization of errors in the cutoff estimates arising from the non-inclusion of other than dipolar field terms. A self contained procedure has been developed for computer use which, for any given location and direction expressed in geographic coordinates, first allows determination of the location and direction relative to the Earth's equivalent magnetic dipole (whose location is determined from the lowest order harmonic field terms). The Stormer equation is then invoked, using these offset dipole coordinates, and a cutoff estimate so produced. This report contains a printed copy of a FORTRAN computer program developed to carry out this task. Author (GRA)

N84-10677# Stanford Univ., Calif. Inst. for Plasma Research.
THE KOREAN AURORAL RECORDS, 1507 - 1747 AND THE SAR (STABLE AURORAL RED) ARCS
Zhuwen Zhang Apr. 1983 28 p refs
(Contract NAS5-24420; Grant NGR-05-020-559; Contract N00014-76-C-0207; Grant NSF ATM-77-24420)
(NASA-CR-174472; NAS 1.26:174472; AD-A130288; SU-IPR-955)
Avail: NTIS HC A03/MF A01 CSCL 04/1

There are many reports of auroral sightings, in Korea during the period AD 1507-1747. On the basis of all their characteristics as reduced from the descriptions of these reports and from several statistical analyses, we believe that most of them were not usual auroras, but most probably were so-called Stable Auroral Red arcs. GRA

N84-10678*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
HIGH-ALTITUDE OBSERVATIONS OF AN INTENSE INVERTED-V EVENT Progress for period ending May 1978
C. Y. Huang, L. A. Frank, and T. E. Eastman Apr. 1983 35 p refs Submitted for publication
(Contract NAS5-20094; Grant NGL-16-001-002; Contract N00014-76-C-0016)
(NASA-CR-174468; NAS 1.26:174468; AD-A130467; U-OF-IOWA-83-8) Avail: NTIS HC A03/MF A01 CSCL 08/14

Inverted-V events which generally occur in the pre-midnight sector over the auroral zone are frequently associated with reversals in the convection electric field. Such a reversal is observed by the University of Iowa quadrispherical LEPEDEA on board ISEE-1 at an altitude of 13 RE on 1 May 1978. The bulk of the plasma shows a large shear over a five-minute interval. The associated change in the convection electric field is 5.1 mV m-1. Large values of the field-aligned current are simultaneously detected. The potential structure appears to extend to the satellite location. Using a theoretical model we have calculated the field-aligned current due to the electric field discontinuity. The magnitude of the parallel potential drop and width of the inverted-V region agree well with observation. Author (GRA)

N84-10679*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

CURRENTS IN THE EARTH'S MAGNETOTAIL Progress Report for period ending 1978
L. A. Frank, C. Y. Huang, and T. E. Eastman Mar. 1983 33 p refs Submitted for publication
(Contract NAS5-26257; Grant NGL-16-001-002; Contract N00014-76-C-0016)
(NASA-CR-174467; NAS 1.26:174467; AD-A130466; U-OF-IOWA-83-11) Avail: NTIS HC A03/MF A01 CSCL 20/9

Currents in the Earth's magnetotail are detected with the plasma instrumentation on board the ISEE-1 spacecraft. Field-aligned currents directed into and out of the ionosphere are found in the boundary layer of the plasma sheet. Typical current densities are in the range of 5 X 10-9 to 5 X 10-8 A/m2. These currents are associated with the Region 1 current system that is observed previously at low altitudes. An intense current sheet is shown to exist at a discontinuity in convection electric fields during a period of great magnetic activity. Electron acceleration, similar to that for electron inverted-V precipitation regions at low altitudes, occurs in this current sheet. Examination of the plasma velocity distributions at a neutral-sheet crossing reveals that the neutral sheet current is carried by electrons and protons. The relative directions for the bulk flows of the proton and electron plasmas indicate that the first adiabatic invariant is not conserved for the protons, and quite possibly for the electrons also. These letter findings are in substantial agreement with a neutral sheet model for acceleration of charged particles in the presence of a weak electric field.
Author

N84-10680# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
SMALL SCALE STRUCTURE IN THE EARTH'S IONOSPHERE: THEORY AND NUMERICAL SIMULATION Interim Report
S. T. Zalesak 15 Jul. 1983 47 p refs Presented at the Theory Inst. in Solar-Terrestrial Phys., Chestnut Hill, Mass, Aug. 1982
(RR0330244)
(AD-A130462; NRL-MR-5119) Avail: NTIS HC A03/MF A01 CSCL 04/1

We describe in qualitative terms the cause and nonlinear evolution of the gradient drift and collisional Rayleigh-Taylor instabilities in the earth's ionosphere, by using the examples of ionospheric barium clouds and equatorial spread F 'bubbles' respectively. We then derive the nonlinear differential equations governing these instabilities. Finally, we discuss the numerical solution of these differential equations. Author (GRA)

N84-10681# Naval Research Lab., Washington, D. C.
LONG WAVELENGTH LIMIT OF THE E X B INSTABILITY
J. D. Huba and S. T. Zalesak 17 Jun. 1983 20 p refs
(AD-A129812; NRL-MR-5117) Avail: NTIS HC A02/MF A01 CSCL 04/1

We present an analytical expression for the growth rate of the E X B instability in the long wavelength limit, i.e., k sub y L sub n always less than 1, where k sub y is the wavenumber and L sub n is the scale length of the density gradient. Specifically, we obtain results for the case of a single discontinuity in plasma density. Author (GRA)

N84-10682# Naval Research Lab., Washington, D. C.
PARAMETRIC EXCITATION AND SUPPRESSION OF CONVECTIVE PLASMA INSTABILITIES IN THE HIGH LATITUDE F-REGION IONOSPHERE
M. J. Keskinen, P. K. Chaturvedi, and S. L. Ossakow 14 Jul. 1983 29 p refs
(DNA Proj. S99-QMXB; RR0330244)
(AD-A130652; NRL-MR-5133) Avail: NTIS HC A03/MF A01 CSCL 04/1

Parametric coupling processes of a large amplitude electromagnetic pump wave with convective plasma fluid instabilities (E X B gradient drift and current convective) in the high latitude F region ionosphere have been studied. We find that a pump wave, with frequency near the upper hybrid frequency and with electric field, can stabilize or destabilize the E X B gradient-drift and/or current convective instability. For parameters typical of the nighttime high latitude F region ionosphere we find stabilization or destabilization with a vertically incident 0 mode carrying a free space incident power density on the order of w/10000 sq m. Author (GRA)

N84-10683# Pennsylvania State Univ., University Park. College of Earth and Mineral Sciences.
LATERAL VARIATIONS IN GEOLOGIC STRUCTURE AND TECTONIC SETTING FROM REMOTE SENSING DATA Final Report, 16 Mar. 1980 - 30 Sep. 1982
Shelton S. Alexander May 1983 231 p refs
(Grant AF-AFOSR-3340-77; AF Proj. A032)
(AD-A130758; AFOSR-83-0610TR) Avail: NTIS HC A11/MF A01 CSCL 08/7

The principal objective of this study was: (1) to assess the usefulness of remote sensing digital imagery, principally LANDSAT multispectral scanning (MSS) data, for inferring lateral variations in geologic structure and tectonic setting; and (2) to determine the extent to which these inferred variations correlate with observed variations in seismic excitation from underground nuclear explosion test sites in the Soviet Union. Soviet, French and U.S. test sites have been investigated to compare their geologic and tectonic responses as seen by LANDSAT. The characteristics of 'granite' intrusive bodies exposed at Semipalatinsk (Degelen), North Africa (Hoggar), NTS (Climax stock), and an analog site in Maine (Mt. Katahdin), have been studied in detail. The tectonic stress field inferred from the tectonic release portion of seismic signatures of explosions in these three areas is compared with local and regional fracture patterns discernable from imagery. The usefulness of satellite synthetic aperture radar (SAR) to determine geologic conditions and delineate fault (fracture) patterns is demonstrated by the analysis of SEASAT data for an area in the eastern United States. Algorithms to enhance structural boundaries and to use textures to identify rock types were developed and applied to several test sites. Author (GRA)

N84-10684# Naval Research Lab., Washington, D. C.
HIGH-LATITUDE F-REGION IRREGULARITIES: INTENSITY AND SCALE SIZE DISTRIBUTIONS
P. Rodrigues and E. P. Szuszczewicz 21 Jul. 1983 55 p refs Sponsored in part by AF and DNA
(Contract MIPR-82-684)
(AD-A130889; NRL-MR-5120) Avail: NTIS HC A04/MF A01 CSCL 04/1

A broad range of lower F-region irregularity scale sizes (150 km $> L >$75m) at high northern latitudes during the spring and summer of 1978 has been studied. The morphology and intensity distribution of the irregularities shows that particle precipitation in the auroral oval and polar cusp are the primary agents in driving density fluctuations. The most intense density fluctuations observed under moderately active geomagnetic conditions occur in the polar cusp, where small scale irregularities are particularly prominent. Absolute density enhancements approaching 10 to the 6th power 3/cm have been observed in the polar cusp. Auroral oval irregularities have absolute density enhancements generally less than the polar cusp enhancements, with maximum values of about 8 x 0,00001 3/cm. Large density enhancements within the polar cap have been detected principally toward the duskward side. These polar cap enhancements are similar to auroral oval enhancements, thus suggesting that polar cap precipitation is the source of the density fluctuations. A region of density depletion with respect to the background photoionization is found toward the dawnward side of the polar cap. Such relative depletions may arise from the joint action of lower F-region recombination rates and enhanced cross-field diffusion. In general, the overall two-cell convection pattern at high latitudes has a minimal effect in the redistribution of precipitation-induced irregularities. GRA

N84-10685# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
KINETIC STUDIES OF THE REACTIONS OF CH3O2 WITH NO2 AND OH WITH HNO3 Final Technical Report
A. R. Ravishankara, F. I. Eisele, and P. H. Wine Mar. 1983 60 p refs

(AD-A130922; DOT-FA78WA-4259; FAA-EE-83-04) Avail: NTIS HC A04/MF A01 CSCL 04/1

The technique of Pulsed Laser Photolysis - long path laser absorption is employed to study the kinetics of the reaction CH3O2 + NO2 k1 CH3O2NO2 + N2 and the reaction OH + HNO3 k2 NO3 + H2O. The first reaction was measured over the temperature range 253-353K by following the reactant CH3O2, while the second reaction was investigated at 298 and 251K by monitoring the product NO3. At all temperatures, k1 is found to monotonically increase with increasing N2 pressure over the range 76-722 Torr, indicating that reaction occurs predominantly by addition. The dependence of k1 on N2 pressure shows that the reaction is in the fall-off region between second and third order kinetics. These results are compared with previous results and their atmospheric implications are discussed. The value of k2 obtained agrees well with previous measurements. In addition, the yield of NO3 in reaction was directly measured to be near unity at both 298 and 251K. GRA

N84-10686# Institute for Atmosphere Optics and Remote Sensing, Hampton, Va.

FORWARD MULTIPLE SCATTERING CORRECTIONS AS FUNCTION OF DETECTOR FIELD OF VIEW

Andrew Zardecki and Adarsh Deepak Aberdeen Proving Ground, Md. Army Chemical Systems Lab. Jun. 1983 40 p refs

(Contract DAAK11-79-C-0100; DA Proj. 1L1-62622-A-552)
(AD-A130631; ARCSL-CR-83039; IFAORS-146) Avail: NTIS HC A03/MF A01 CSCL 04/1

The theoretical formulations are given for an approximate method based on the solution of the radiative transfer equation in the small angle approximation. The method is approximate in the sense that an approximation is made in addition to the small angle approximation. Numerical results were obtained for multiple scattering effects as functions of the detector field of view, as well as the size of the detector's aperture for three different values of the optical depth tau (=1.0, 4.0 and 10.0). Three cases of aperture size were considered--namely, equal to or smaller or larger than the laser beam diameter. The contrast between the on-axis intensity and the received power for the last three cases is clearly evident. GRA

N84-10687# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.

A REVIEW OF OPTICAL DATA ANALYSIS RELATED TO THE MODELLING OF VISIBLE AND OPTICAL INFRARED ATMOSPHERIC PROPERTIES Final Report, 1 Oct. 1978 - 30 Sep. 1981

Richard W. Johnson and Jacqueline I. Gordon Jan. 1982 73 p refs

(Contract F19628-78-C-0200; AF Proj. 7670)
(AD-A131486; AFGL-TR-82-0086; SIO-83-5) Avail: NTIS HC A04/MF A01 CSCL 20/6

This Final Report summarizes the results of a data analysis and modelling program addressing optical atmospheric properties in the western European environment. Two sets of data, one a series of surface measurements and the other an airborne set, were used in the analysis. GRA

N84-10688# SRI International Corp., Menlo Park, Calif.

THE ANISOTROPY OF HIGH LATITUDE NIGHTTIME F-REGION IRREGULARITIES

Robert C. Livingston, Jacqueline Owen, Charles L. Rino, and Roland T. Tsunoda 31 Mar. 1982 34 p refs

(Contract DNA001-81-C-0076; SRI Proj. 2623)
(AD-A131215; DNA-TR-81-87) Avail: NTIS HC A03/MF A01 CSCL 04/1

The anisotropy of intermediate-scale, F-region irregularities in the nighttime auroral zone is described. The study is based upon spaced-receiver phase-scintillation measurements made with the Wideband satellite at Poker Flat, Alaska. A systematic dependence of irregularity anisotropy with local time and magnetic latitude is observed, suggesting convective control. Sheet-like irregularities are confined to the zone of east-west drift near the equatorward boundary of the auroral zone. At the flow reversal, or Harang discontinuity, the cross-field extension of the sheets is reduced. The extension of rod-like irregularities, which are observed poleward of the zonal convection boundary, also shows apparent convection dominance. Mechanisms for convection control of the anisotropy are discussed. Author (GRA)

N84-10689# SRI International Corp., Menlo Park, Calif.

EVIDENCE OF EAST-WEST STRUCTURE IN LARGE-SCALE F-REGION PLASMA ENHANCEMENTS IN THE AURORAL ZONE

Roland T. Tsunoda and James F. Vickrey 1 May 1982 43 p refs

(Contracts DNA001-82-C-0021; F49620-80-C-0014; Grant NSF ATM-78-23658)
(AD-A131263; DNA-TR-82-10) Avail: NTIS HC A03/MF A01 CSCL 20/9

Large-scale (10- to 100-km) plasma-density enhancements appear to be an integral feature of the auroral F-layer ionosphere. These enhancements, called F-region blobs, have been detected with the Chatanika incoherent-scatter radar, and are particularly noticeable during recent years of high solar activity. Blobs have attracted considerable interest because of their propensity for structuring, apparently via the gradient-drift and current-convective instabilities. Although both mechanisms predict the generation of longitudinal structure, no measurements have been made to verify this hypothesis. In this report, we present the first direct evidence that blobs have east-west structure. The observed longitudinal structure is shown to be consistent with the production of a blob by locally intense particle precipitation at the largest scales (approx. 500 km) and the structuring of the blob by the gradient-drift instability at intermediate scales (similar to 150). Author (GRA)

N84-10690# National Bureau of Standards, Boulder, Colo. Wave Propagation Lab.

ATMOSPHERIC INFRARED BACKSCATTER: SUMMARY OF PRESENT KNOWLEDGE AND RECOMMENDATIONS FOR FUTURE WORK

F. F. Hall, Jr. Feb. 1983 154 p refs

(PB83-222281; NOAA-TM-ERL-WPL-110; NOAA-83061502) Avail: NTIS HC A08/MF A01 CSCL 04A

Atmospheric aerosols determine by their size distributions and compositions the backscatter that infrared lidars measure. The global characteristics of the larger aerosols in the planetary boundary layer, free troposphere, and stratosphere are presented. Author (GRA)

N84-10691# National Center for Atmospheric Research, Boulder, Colo.

MECHANISM AND RATES OF THE GAS PHASE OXIDATIONS OF SULFUR DIOXIDE AND THE NITROGEN OXIDES IN THE ATMOSPHERE

Jack G. Calvert and William R. Stockwell Jul. 1983 100 p refs

(Grant EPA-R-806479)
(PB83-231324; EPA-600/D-83-079) Avail: NTIS HC A05/MF A01 CSCL 04A

As knowledge of the atmospheric chemistry of the SO2, NO, and NO2 continues to grow, it becomes increasingly clear that many different chemical reactions contribute to the oxidation of these oxides in the atmosphere. Solution phase and gas phase chemistry are both important to 'acid rain' development, and gas-solid, gas-liquid, liquid-solid as well as simple gaseous molecule interactions are seemingly important in some circumstances as well. The evaluation of the mechanism and rates of solution phase and heterogeneous pathways for SO2 and NOx oxidation within the troposphere, the significance of surface removal processes and the transport and diffusion processes are much less amenable to simple laboratory studies and quantification. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-10692*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HY-WIRE AND FAST ELECTRIC FIELD CHANGE MEASUREMENTS NEAR AN ISOLATED THUNDERSTORM
Robert H. Holzworth and David M. LeVine Aug. 1983 27 p refs
(NASA-TM-85072; NAS 1.15:85072) Avail: NTIS HC A03/MF A01 CSCL 04B

Electric field measurements near an isolated thunderstorm at 6.4 km distance are presented from both a tethered balloon experiment called Hy-wire and also from ground based fast and slow electric field change systems. Simultaneous measurements were made of the electric fields during several lightning flashes at the beginning of the storm which the data clearly indicate were cloud-to-ground flashes. In addition to providing a comparison between the Hy-wire technique for measuring electric fields and more traditional methods, these data are interesting because the lightning flashes occurred prior to changes in the dc electric field, although Hy-wire measured changes in the dc field of up to 750 V/m in the direction opposite to the fair weather field a short time later. Also, the dc electric field was observed to decay back to its preflash value after each flash. The data suggest that Hy-wire was at the field reversal distance from this storm and suggest the charge realignment was taking place in the cloud with a time constant on the order of 20 seconds. Author

N84-10693# Air Force Geophysics Lab., Hanscom AFB, Mass.
A STUDY OF CIRRIFORM CLOUDS OVER ELEVEN USSR STATIONS Interim Report
Yutaka Izumi 14 Dec. 1982 149 p
(AF Proj. 6670)
(AD-A130085; AFGL-TR-82-0384; AFGL-ERP-814) Avail: NTIS HC A07/MF A01 CSCL 04/2

The frequency, top and base heights, thickness, and liquid water content of cirriform clouds over 11 stations in the USSR are presented by months and by seasons and summarized for the 12-month period. Comparison is also made with aircraft observations of cirriform clouds over the European part of the USSR. Author (GRA)

N84-10694# Air Force Geophysics Lab., Hanscom AFB, Mass.
AN EVALUATION OF AN AUTOMATIC CELL DETECTION AND TRACKING ALGORITHM
James G. Wieler, F. Ian Harris, and Michael R. Snapp 3 Nov. 1982 52 p refs
(AF Proj. 2781)
(AD-A130088; AFGL-TR-82-0368; AFGL-ERP-811) Avail: NTIS HC A04/MF A01 CSCL 17/9

A storm tracking algorithm designed to detect and track fine structure in digitized radar data is evaluated. These fine structures are defined by regions containing values within 3 dB of peaks in reflectivity factor. The algorithm describes storm structure and evolution by correlating these peak regions in time and space. The evaluation consists of a comparison of the algorithm output with raw data and with output from an AFGL algorithm which detects and tracks three dimensional reflectivity weighted centroids defined by a preselected threshold. It is concluded that the algorithm cannot reliably detect and track significant structures within storms when applied to data sets with a temporal resolution of aprox. 6 min and a spatial resolution of 1.0 deg in azimuth and 0.7 deg in elevation. The significance of tracking 3 dB peaks is questioned and the implication of defining a larger peak threshold is discussed. The algorithm does track the large features of storms with results similar to the AFGL algorithm. However, it does not run in real time and is not modular, unlike the AFGL algorithm. Author (GRA)

N84-10695# Illinois State Water Survey, Urbana.
STATISTICS OF INSTANTANEOUS RAINFALL RATES Final Report, 30 Oct. 1981 - 30 Mar. 1983
Douglas M. A. Jones and Wayne M. Wendland Feb. 1983 56 p refs
(AD-A130089; AFGL-TR-83-0056) Avail: NTIS HC A04/MF A01 CSCL 04/2

The known sources of data from arrays of instantaneous precipitation intensity recorders were obtained. Data were analyzed for line averages of the percent frequency of occurrence of exceedance of threshold precipitation intensities. The correlation coefficients of the precipitation intensity at sites at varying distances from a comparison site were determined and found to decrease with distance; the rate of decrease was an inverse function of distance and a function of the type of precipitation: showery or continuous. Showery rains were found to decorrelate about 12 km from the comparison site while continuous rains decorrelated near 50 km. Precipitation events had longer durations when the continuous rains were produced by cyclonic systems with some months experiencing measurable precipitation rates 20% of the time. Autumn tended to be the season with the least percentage of precipitation time. Single station intensity data collected is the USA are three other continents were compared. The greatest precipitation intensity observed at any one of these sites was 6.31 mm/min at Urbana. By comparison, the maximum rate in southern Germany was 0.32 mm/min and in Zimbabwe 5.08 mm/min. GRA

N84-10696# Aeronautical Research Associates of Princeton, Inc., N. J.
FURTHER DEVELOPMENTS OF THE A. R. A. P. MODEL FOR THE ATMOSPHERIC MARINE ENVIRONMENT Final Report, 13 Aug. 1981 - 12 Feb. 1983
W. S. Lewellen, R. I. Sykes, and D. A. Oliver Monterey, Calif. Naval Environmental Prediction Research Facility May 1983 173 p refs
(Contract N00228-81-C-H459)
(AD-A129862; ARAP-488; NEPRF-CR-83-05) Avail: NTIS HC A08/MF A01 CSCL 04/2

This report presents further developments of A.R.A.P.'s model for computing the detailed low-level atmospheric distribution of velocity, temperature, moisture, refractive index, and the turbulent variations of these quantities. A number of simulations of possible fog scenarios have been run and compared with Calspan data. The detailed evolution of wave turbulent interactions in the inversion which caps the mixed layer has been analyzed with a view towards simpler parameterization of this phenomenon. The model has been extended in two quite separate areas: (1) to exhibit the role of turbulent agglomeration in cloud microphysics; and (2) to examine the conditions under which the turbulent macroscale becomes highly anisotropic and to provide a relatively simple means for incorporating this effect into our turbulent transport model whenever necessary. Preliminary analysis is given to argue that the A.R.A.P. model can be used as the basis of parameterization of the influence of sub-grid turbulent fluxes in mesoscale meteorological models. Author (GRA)

N84-10697# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
ATLAS OF MEAN SEA-LEVEL PRESSURE Technical Note, 1973-1978
Henry A. Chary Nov. 1982 207 p
(USAFETAC Proj. 2242)
(AD-A130207; AD-E850381; USAFETAC/TN-82/007) Avail: NTIS HC A10/MF A01 CSCL 04/2

An atlas of quarter-hemispheric maps of mean sea-level pressure and its standard deviation is presented. The maps are based on the 6-year period of record for 1973-1978. The development of the data base used is briefly discussed. The maps are based on the UAPIP data which is derived from the summarized Air Force Global Weather Central (AFGWC) upper-air analysis. GRA

N84-10698# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OB-

SERVATIONS (RUSSWO). PARTS A-F. CAPE ROMANZOF AFS, ALASKA Final Report
Mar. 1983 446 p
(AD-A130206; AD-E850374; USAFETAC/DS-83/008) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Cape Romanzof AFS, Alaska. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric- Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-10699# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F. LEMOORE NAS, CALIFORNIA Final Report
1 Nov. 1982 450 p
(AD-A130205; AD-E850358; USAFETAC/DS-82/058) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather - observations for Lemoore NAS, California. It contains the following Parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, - Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation - counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-10700# Naval Oceanography Command Center/Joint Typhoon Warning Center, FPO San Francisco, Calif.
FORECAST VERIFICATION AND RECONNAISSANCE DATA FOR SOUTHERN HEMISPHERE TROPICAL CYCLONES Technical Note, Jul. 1980 - Jun. 1982
John W. Diercks, Robert C. Weir, and Mary K. Kopper Sep. 1982 80 p refs
(AD-A130187; NOCC/JTWC-TN-82-1) Avail: NTIS HC A05/MF A01 CSCL 04/2

The Joint Typhoon Warning Center area of responsibility includes the Southern Hemisphere, from 180 deg. longitude westward to the east coast of Africa. Forecast verification and reconnaissance data for those Southern Hemisphere tropical cyclones that occurred are documented. GRA

N84-10701# Air Force Geophysics Lab., Hanscom AFB, Mass.
DIAGNOSIS OF THE COMMA CLOUD OF 10 APRIL 1979, ABRIDGED REPORT
Daniel V. Ridge 14 Dec. 1982 62 p refs
(AF Proj. 6670)
(AD-A130649; AFGL-TR-82-0303; AFGL-ERP-813) Avail: NTIS HC A04/MF A01 CSCL 04/2

On 10 April 1979 a comma cloud developed in association with a severe storm outbreak in Texas and Oklahoma during the AVE-SESAME 1 regional-scale experiment. With rather high time- and space-resolution rawinsonde data, plus GOES, radar, and surface data, a diagnosis was made of the structure and evolution of the disturbance which spawned the clouds. Vertical motion was computed by the kinematic method and from the quasi-geostrophic (QG) omega equation. An alternate partition of the GQ forcing function was tested. Five mesoscale waves in the mid- to high-troposphere strongly affected the weather patterns on 10 April 1979. These disturbances had wavelengths from 500 to 800 km, phase speeds of 20 to 33 m/s, and 500 mb height amplitudes around 30 m. They showed excellent time continuity in the 500 mb relative vorticity analyses. Both omega analyses showed 500 mb rising motion in eastern New Mexico six hours before a subsynoptic surface low and tornadic storms developed just to the east in Texas. Kinematic omegas indicated subsidence over the Texas coastal plain for six hours in the afternoon, evidently associated with maintenance of a surface pressure ridge and an intense low-level inversion which inhibited convection in that area. Because of its geostrophic sensitivity and computational ease, kinematic omega is more useful than QG omega for operational purposes. However, the two methods make an independent and complementary pair for research purposes. GRA

N84-10702# National Climatic Center, Asheville, N. C.
WIND AND WAVE SUMMARIES FOR SELECTED U.S. COAST GUARD OPERATING AREAS
David Paskausky, R. G. Quayle, R. G. Baldwin, T. R. Karl, and Kurt G. Zimmerman Washington Coast Guard Apr. 1983 404 p refs
(AD-A130647; MIPR-Z70099-2-06128; USCG-D-11-83) Avail: NTIS HC A18/MF A01 CSCL 05/10

This report was prepared to describe the wind and wave conditions that can be expected in U.S. Coast Guard geographical operating areas. The intent is to provide operational program managers a tool to use when considering the potential applications of conventional and advanced marine vehicles (AMVs) to Coast Guard missions. It is also intended to supplement research determining the feasibility of alternate energy sources that involve wind or waves. This work was performed by the National Climatic Data Center under the direction of the U.S. Guard Research and Development Center for the Office of Research and Development. GRA

N84-10703# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.
CLOUD PHYSICS AND NUCLEATION THEORY: REVISIONS INDICATED BY NEW MEASUREMENTS OF THE ELECTRICAL CONDUCTIVITY OF EVAPORATION-HUMIDIFIED AIR Special Publication, Dec. 1980 - Dec. 1981
Hugh R. Carlon May 1983 39 p refs
(DA Proj. 1L1-1101-A-91A)
(AD-A130696; ARCSL-SP-81026) Avail: NTIS HC A03/MF A01 CSCL 04/2

A new theory of cloud physics is presented, based on new measurements of the electrical conductivity of moist air humidified by evaporation, combined with other measurements of related phenomena by mass spectrometry, infrared spectroscopy, and adiabatic expansion experiments in cloud chambers. It is shown that enormous populations of large, neutral molecular clusters of water molecules can exist in the vapor produced by evaporating liquid water, and at the vapor/liquid boundary layer that virtually all vapor initially can be clustered. The neutral clusters dissociate into ions or serve as charge carriers to a small extent (given by the equilibrium dissociation constant or 'ion product' of water) as measured by electrical conductivity using cells of a new design to monitor the temperature and humidity dependencies of the neutral cluster populations. The hydrogen bonds in the neutral clusters are strong absorbers of infrared radiation. Therefore, the activity of the neutral clusters in water vapor or moist air also can be monitored by infrared absorption and emission. The theory is supported by cluster modeling, as well as thermodynamic studies. It is shown that water droplet nucleation can be a temperature phenomenon and that supersaturations of more than perhaps one percent need not exist. The possible existence of a temperature-dependent energy barrier to nucleation in subsaturated conditions is demonstrated. Author (GRA)

N84-10704# Illinois State Water Survey, Champaign. Meteorology Section.
SUMMARY OF THE VIN FIELD PROGRAM: SUMMER 1979
B. Ackerman, R. W. Scott, and N. E. Westcott Feb. 1983 119 p refs
(Grant NSF ATM-78-08865)
(AD-A130836; ARO-15529.11-GS) Avail: NTIS HC A06/MF A01 CSCL 04/2

The VIN project, a coordinated research effort by the Department of Environmental Sciences of the University of Virginia, the Illinois State Water Survey, and the Cumulus Group of NOAA (NOAA/NHEML and later NOAA/OWRM) was developed to investigate the association between the low-level wind field and convective activity in the midwestern U.S. and to further explore the relationships between surface convergence and rainfall found by Ulanski and Garstang in Florida. A key element of the project was a field program in central Illinois, designed specifically to collect measurements for a study of the role of low-level and surface convergence in the evolution of precipitating convective systems and for seeking methods which might be useful in the very short-range forecasting of convective rainfall. This report provides a description of the field program conducted in central Illinois during the summer of 1979, the equipment deployed, and the data base which was generated. In addition, a daily summary of synoptic-scale and local weather and of availability of special observations is given in the Appendix for each day during the program. Author (GRA)

N84-10705# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. CAPE LISBURNE ALASKA AFS Final Report
Jun. 1983 500 p
(AD-A131194; AD-E850399; USAFETAC/DS-83/021) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Cape Lisburne AFS, Alaska. It contains the following parts: (A) Weather conditions; Atmospheric phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus visibility; sky cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-10706# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
HEIGHT EXTRAPOLATION OF WIND DATA
Amir S. Mikhail Nov. 1982 28 p refs
(Contract DE-AC06-76RL-01830)
(DE83-012974; PNL-4367) Avail: NTIS HC A03/MF A01

Hourly average data for a period of 1 year from three tall meteorological towers - the Erie tower in Colorado, the Goodnoe Hills tower in Washington and the WKY-TV tower in Oklahoma - were used to analyze the wind shear exponent variability with various parameters such as thermal stability, anemometer level wind speed, projection height and surface roughness. Different proposed models for prediction of height variability of short term average wind speeds were discussed. Other models that predict the height dependence of Weilbull distribution parameters were tested. The observed power law exponent for all three towers showed strong dependence on the anemometer level wind speed and stability (nighttime and daytime). It also exhibited a high degree of dependence on extrapolation height with respect to anemometer height. These dependences became less severe as the anemometer level wind speeds were increased due to the turbulent mixing of the atmospheric boundary layer. The three models used for Weilbull distribution parameter extrapolation were the velocity dependent power law model (Justus), the velocity, surface roughness, and height dependent model (Mikhail) and the velocity and surface roughness dependent model (NASA). DOE

N84-10707# Pacific Northwest Lab., Richland, Wash.
MAKING USE OF WIND ENERGY: A COURSE IN EVALUATING AND CHOOSING SITES FOR SMALL WIND MACHINES
R. Zengerle Jul. 1983 117 p refs
(Contract DE-Ac06-76RL-01830)
(DE83-014945; PNL-SA-9566) Avail: NTIS HC A06/MF A01

A course has been developed to present an integrated, not overly technical approach to siting a wind machine. In the context of this course, the term siting is used in a broad sense to include estimating the wind resource at a site, selecting the best wind machine site, estimating energy production of a wind machine, and estimating the economic value of a wind machine. The workbook treats various topics at significantly greater detail, illustrating various problem-solving techniques with sample problems. In addition, a number of practice problems are given. Complete answers are provided for each problem. DOE

N84-10708# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
MARINERS WEATHER LOG, SPRING 1983, VOLUME 27, NUMBER 2
Elwyn E. Wilson, ed. 1983 71 p
(PB83-220491; NOAA-83061306-Vol-27-No-2) Avail: NTIS HC A04/MF A01 CSCL 04B

Marine observations program, tips to the radio offices, the editors desk, marine weather review, and tropical cyclone weather reports are discussed. Author

N84-10709# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
THE FGGE LEVEL 3-B DAILY GLOBAL ANALYSES, PART 1 Technical Report, Dec. 1978 - Feb. 1979
Jeffrey J. Ploshay, Robert K. White, and Kikuro Miyakoda Mar. 1983 285 p refs
(PB83-221051; NOAA-DR-ERL-GFDL-1-Pt-1;
NOAA-83061605-Pt-1) Avail: NTIS HC A13/MF A01 CSCL 04B

The report contains daily global analyses of the FGGE Level 3-b data set produced at GFDL (Geophysical Fluid Dynamics Laboratory). GFDL was one of the two level 3-b data producers for the entire FGGE year the other producer was the ECMWF (European Center for Medium-Range Weather Forecasts). FGGE provided an unprecedented volume of meteorlogical data, from various sources, for the year 1979. The purpose of FGGE are to observe comprehensively and accurately the atmospheric state and circulation on a global scale, and to increase understanding of the dynamics of the equatorial atmosphere and ocean to ultimately improve weather and climate prediction. Author

N84-10710# National Weather Service, Kansas City, Mo.
SOME BASIC ELEMENTS OF THUNDERSTORM FORECASTING
Richard P. McNulty May 1983 28 p refs
(PB83-222604; NOAA-TM-NWS-CR-69; NOAA-83062209) Avail: NTIS HC A03/MF A01 CSCL 04B

This paper describes several basic elements important to forecasting significant convection. Significant convection includes severe thunderstorms, but also encompasses non-severe thunderstorms. The four parameters needed for the occurrence of significant convection are discussed. These are the presence of instability or a destabilization mechanism, abundant low-level moisture, upper level divergence, and a low-level boundary to force the thunderstorms into existence. The basic concept of a boundary is discussed and several types of boundaries are described. The purpose of mesoanalysis of surface data is to identify these boundaries. It was also realized that once a boundary has been

identified, it is still not easy to say when or if the boundary will produce convection. Author (GRA)

N84-10711# National Weather Service, Kansas City, Mo.
MULTIPURPOSE WEATHER ROUNDUP PROGRAM
Warren E. Sunkel May 1983 47 p refs
(PB83-222612; NOAA-NWS-CROP-8; NOAA-83062207) Avail: NTIS HC A03/MF A01 CSCL 04B

Program RWR9 reads Surface Airways Observations (SAO's) from the local AFOS database and reformats them into plain language collectives for Hourly, State, and Regional Weather Roundups. Output is suitable for direct transmission on the state weather wire. Program options also allow the creation of a locally stored Broadcast Text, which contains observations to be broadcast on the weather radio. GRA

N84-10712# Wisconsin Univ., Madison. Dept. of Meteorology.
ATLAS OF NORTHERN HEMISPHERE EXTRATROPICAL CYCLONE ACTIVITY, 1958 - 1977
Linda M. Whittaker and Lyle H. Horn Oct. 1982 70 p refs
(Grants NSF ATM-76-22200; NSF ATM-79-18761)
(PB83-225722; UWMETW1-82/1) Avail: NTIS HC A04/MF A01 CSCL 04B

Cyclone frequency, cyclogenesis and the primary and secondary tracks followed by extratropical cyclones within the Northern Hemisphere are examined or each of the twelve months. The data was compiled from several sources for the period 1958-1977. Cyclogenesis was defined as the point of origin of a cyclone provided it maintained a closed isobar for 24 hours. Cyclone frequency was determined from the number of occurrences of an extratropical cyclone passing through a 5 degree latitude-longitude grid box. Analyses of the grid values of cyclone frequency reveal relative maxima through which cyclone tracks are positioned. The tracks are partitioned into primary and secondary tracks depending on the magnitude of the relative maxima of cyclone frequency. Author

N84-10713# National Oceanic and Atmospheric Administration, Miami, Fla. Research Facilities Center.
RESEARCH FACILITIES REPORT, FISCAL YEAR 1982 Annual Report
Apr. 1983 34 p refs
(PB83-224857; NOAA-83062702) Avail: NTIS HC A03/MF A01 CSCL 04B

The resources and accomplishments are described. Instrumented aircraft are provided to support to research programs. Large, complex state of the art instrumentation systems for long duration missions under all weather conditions including severe weather and hurricane penetrations are operated. GRA

N84-10714# Montana Water Resources Research Center, Bozeman.
METEOROLOGICAL AND CLIMATOLOGICAL APPROACH IN DETERMINING SNOWPACK ACCUMULATION AT SNOW COURSE SITES IN A MONTANA WATERSHED Final Report
W. Bruce Tremper, Paul J. Dawson, and Robert H. Yaw Jun. 1983 37 p refs
(Contract DI-14-34-0001-1128)
(PB83-226852; MWRRC-132; W83-03465;
OWRT-A-132-MONT(1)) Avail: NTIS HC A03/MF A01 CSCL 04B

The feasibility of adequately estimating snowpack water equivalent at snow course sites in southwest Montana using meteorological parameters along with precipitation and temperature data from local climate stations in an inexpensive statistical model was tested. The model was developed using a sample period of 200 days where weather and climate parameters were entered as independant variables in a statistical stepwise multiple regression equation with daily snowfall at snow course and SNOTEL sites as the dependent variable. The equations generated were then run with data from a 17 year period to estimate monthly snow accumulation at nearby monthly snow course sites, then compared to actual monthly totals to determine the success of the model. GRA

N84-10715# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
DESCRIPTION OF NCAR (NATIONAL CENTER FOR ATMOSPHERIC RESEARCH) COMMUNITY CLIMATE MODEL (CCMOB)
David L. Williamson May 1983 96 p refs
(Grant NSF 82-17015)
(PB83-231068; NCAR/TN-210-STR) Avail: NTIS HC A05/MF A01 CSCL 04B

The details of the governing equations, physical parameterizations, and numerical algorithms defining the NCAR Community Climate Model (CCMOB) are presented. The Presentation is ordered logically to match the code but does not make explicit reference to details of the code. The model uses the spectral transform method in the horizontal directions, finite difference approximations in the vertical direction, and semi-implicit time differences. The physical parameterizations include radiation with interactive clouds derived from the precipitation characteristics, convective adjustment, stable condensation, surface fluxes, and, over nonocean points, a surface energy balance. GRA

N84-10716# National Weather Service, Silver Spring, Md. Office of Meteorology.
NATIONAL WEATHER SERVICE PUBLIC FORECAST VERIFICATION SUMMARY, APRIL 1978 TO MARCH 1982
Paul D. Polger Apr. 1983 119 p refs
(PB83-232173; NOAA/TM/NWS/FCST-28; NOAA-83071301)
Avail: NTIS HC A06/MF A01 CSCL 04B

Both WSFO and NMC forecasts of temperature and precipitation continued to improve during the 4-year period from 1978 to 1981. The NMC guidance for temperature was more erratic, but on average the difference between NMC and the WSFO's remained consistent with the previous 4-year period. The percent correct for precipitation climbed steadily to a peak in 1980 before a reversal. The percent improvement of the probability of precipitation Brier score over climatology was at its highest levels for the 4 year period, prior to the reversal in 1981. GRA

N84-10717# National Oceanic and Atmospheric Administration, Rockville, Md. Air Resources Labs.
BRANCHING ATMOSPHERIC TRAJECTORY (BAT) MODEL
Jerome L. Heffter May 1983 24 p refs
(PB83-233023; NOAA-TM-ERL-ARL-121; NOAA-83071810) Avail: NTIS HC A02/MF A01 CSCL 04B

A Branching Atmospheric Trajectory (BAT) model that is used for a variety of long angle diagnostic and assessment purposes is presented. The three layer Lagrangian model can calculate trajectories forward or backward in time that branch due to vertical wind shears associated with day/night transitions. Model output includes tabulated concentrations at one or more sampling sites, concentration maps, and trajectory maps depicting a branched trajectory with the mass at each day/night transition and layer identification for each branch. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-10718*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTARTIC SEA ICE, 1973 - 1976: SATELLITE PASSIVE-MICROWAVE OBSERVATIONS
H. Jay Zwally, Josefino C. Comiso, Claire L. Parkinson, William J. Campbell (Geological Survey, Takoma, Wash.), Frank D. Carsey (Jet Propulsion Lab., California Inst. of Tech., Pasadena), and Per Gloersen Washington 1983 216 p refs Original document contains color illustrations
(NASA-SP-459; NAS 1.21:459; LC-83-600167) Avail: NTIS

HC A10/MF A01; SOD HC $21.00 CSCL 08L

Data from the Electrically Scanning Microwave Radiometer (ESMR) on the Nimbus 5 satellite are used to determine the extent and distribution of Antarctic sea ice. The characteristics of the southern ocean, the mathematical formulas used to obtain quantitative sea ice concentrations, the general characteristics of the seasonal sea ice growth/decay cycle and regional differences, and the observed seasonal growth/decay cycle for individual years and interannual variations of the ice cover are discussed. The sea ice data from the ESMR are presented in the form of color-coded maps of the Antarctic and the southern oceans. The maps show brightness temperatures and concentrations of pack ice averaged for each month, 4-year monthly averages, and month-to-month changes. Graphs summarizing the results, such as areas of sea ice as a function of time in the various sectors of the southern ocean are included. The images demonstrate that satellite microwave data provide unique information on large-scale sea ice conditions for determining climatic conditions in polar regions and possible global climatic changes. J.M.S.

N84-10719# TRW Defense and Space Systems Group, Redondo Beach, Calif.

MICROWAVE BACKSCATTERING FROM SHORT GRAVITY WAVES. A DETERMINISTIC, COHERENT AND DUAL-POLARIZED LABORATORY STUDY Status Report, 1 May 1981 - 1 May 1982

Daniel S. W. Kwoh and Bruce M. Lake Jul. 1983 89 p refs (Contract N00014-81-C-0217; NR Proj. 083-556; NR Proj. 387-133)

(AD-A131217; TRW-37564-6001-UT-00) Avail: NTIS HC A05/MF A01 CSCL 08/3

The fundamental mechanisms of microwave backscattering from short gravity waves are investigated in the laboratory using a CW coherent dual-polarized focused radar and a laser scanning slope gauge which provides an almost instantaneous profile of the water surface while scattering is taking place. The surface is also monitored independently for specular reflection using an optical sensor. It is found that microwave backscattering occurs in discrete bursts which are highly correlated with gentle breaking of the waves. These backscattering bursts are either completely nonspecular or are partially specular in nature. The specular contribution is found to be more important than generally expected, even at moderate to high incidence angles, and its source seems to be the specular facets in the turbulent wake and the capillary waves generated during breaking. Completely nonspecular backscattering bursts are analyzed by using the Method of Moments to numerically compute the backscattering complex amplitudes from the measured profiles and then comparing the computed results. Using numerical modeling, it can be shown that for a wave in the process of breaking, its small-radius crest is the predominant scattering source in a manner akin to wedge diffraction as described by the Geometric Theory of Diffraction (GTD). The parasitic capillary waves generated during wave breaking also scatter. Their contribution is in general smaller than that of the crest and can be understood in terms of small perturbation theory. GRA

N84-10720# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.

A BATHYTHERMOGRAPH TO SOUND VELOCITY PROFILE PROGRAM FOR THE HP-41CV CALCULATOR, INCLUDING A NORTHERN HEMISPHERE SALINITY PROFILE LIBRARY Final Report

George A. Kerr Jan. 1983 93 p

(AD-A130761; NORDA-TN-193) Avail: NTIS HC A05/MF A01 CSCL 08/10

This technical note documents a program written specifically for the HP-41CV calculator to convert a bathythermograph profile to a sound speed profile. The format of the report follows the guidelines set forth by the Navy Tactical Support Activity, Fleet Mission Program Library. The program documented herein differs from existing calculator programs used for a similar purpose (Kerr, 1982) in that an archival salinity profile library is included with the program. Magnetic card copies of the program and salinity profile library may be obtained from the Naval Oceanographic Office, Code 9200. Author (GRA)

N84-10721# Oregon State Univ., Corvallis. School of Oceanography.

CTD TRANSECT OF THE KUROSHIO EXTENSION 27-42 DEG N, 152 DEG E

P. P. Niiler, J. Dellani Whitman, and M. Raymer (Woods Hole Oceanographic Inst.) Jun. 1983 141 p

(Contract N00014-79-C-0004; NR Proj. 083-102)

(AD-A131329; DATA-94; REF-82-7) Avail: NTIS HC A07/MF A01 CSCL 08/10

This report presents CTD observations of temperature and salinity as a function of hydrostatic pressure in the Kuroshio Extension in May 1981. Lowerings were made from the surface to the bottom along 152 E about every 30 nautical moles between 29 N and 41 N. Identical sections were made in July 1980 and May 1981. The scientific objectives of these CTD surveys are to document the water masses presently in this area, and to compile the relative geostrophic currents from the surface to the bottom. GRA

N84-10722# Washington Univ., Seattle. Sea Grant Program.

HYDROACOUSTICS RESEARCH IN SEATTLE, WASHINGTON, 1967 - 1981. AN ANNOTATED BIBLIOGRAPHY

O. A. Mathisen and C. A. Goebel Feb. 1983 20 p Sponsored by National Oceanic and Atmospheric Administration

(PB83-220483; WSG-UN-83-1; NOAA-83061303) Avail: NTIS HC A02/MF A01 CSCL 08A

The report contains publications from 1968 to the present - for publications included in this listing at the University of Washington's Applied Physics Laboratory and Department of Oceanography and at the National Marine Fisheries Service's Northwest Fisheries Center. The following list contains all citeable literature, including dissertations but excluding contract reports, which cover the 'gray' literature available only to local and restricted groups. The papers are listed under a few major headings, in alphabetical order by author or senior author in case of multiple authorship. (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-10723# Polish Academy of Sciences, Warsaw.

CONFERENCE ON ULTRASONICS IN BIOLOGY AND MEDICINE, UBIOMED 6: REPORT SUMMARIES

1983 58 p refs Conf. held in Warsaw, 19-23 Sep. 1983

(ISSN-0208-5658) Avail: Issuing Activity

Bovine kidney cell cultures were used as an experimental model for a complex study of the biophysical mechanism of ultrasonic action. The cell cultures were grown in Minimum Essential Medium supplemented with 5-10% calf serum in Roux bottles. Suspensions of 1,000,000 cells in ml using trypsin were prepared. The sonication of cells at low and very low ultrasound intensity in 37 C water bath was carried out. In the first series of experiments the morphological and functional changes of cells immediately after sonication were evaluated. In the second series of experiments the sonicated cells were seeded in Roux bottles and grown in optimal conditions. In both series of experiments the changes in morphology and viability of cells influenced by ultrasound of low and very low intensity levels were observed. The possible mechanisms of ultrasonic action on cell cultures are discussed. N.W.

N84-10724*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE GROWTH OF PARACOCCUS HALODENITRIFICANS IN A DEFINED MEDIUM

Lawrence I. Hochstein and Geraldine A. Tomlinson (Santa Clara Univ., Calif.) Oct. 1983 16 p refs

(NASA-TM-84411; A-9487; NAS 1.15:84411) Avail: NTIS

HC A02/MF A01 CSCL 06C

A synthetic medium, consisting of inorganic salts and any of a number of carbon sources, supported the aerobic growth of Paracoccus halodenitrificans when supplemented with thiamine. The same medium plus a nitrogenous oxide supported anaerobic growth when additionally supplemented with methionine. The observation that vitamin B12 or betaine replaced methionine suggested that P. halodenitrificans had a defect in the cobalamin dependent pathway for methionine biosynthesis, as well as the inability to synthesize betaine when growing anaerobically. Author

N84-10725# Air Force Academy, Colo.
STABILITY OF RAT BRAIN GLUTAMINE SYNTHETASE TO OXYGEN TOXICITY (OXYGEN AT HIGH PRESSURE) Final Report
James T. Webb Jul. 1983 17 p refs
(AF Proj. 2308)
(AD-A131049; USAFA-TR-83-12) Avail: NTIS HC A02/MF A01 CSCL 06/20

Enzyme assays using the gamma-glutamyl transferase method provided estimates of glutamine synthetase activity in rat brain homogenates subjected to a pure oxygen environment for over three hours. No loss of activity was detected versus controls subjected to air or pure nitrogen. This finding supports the lack of any connection between convulsions caused by in vivo inhibition of glutamine synthetase and convulsions caused by oxygen toxicity (oxygen at high pressure). Author (GRA)

N84-10726# Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
MICROBIAL FOULING AND ITS EFFECT ON POWER GENERATION Final Report, 15 May 1980 - 14 May 1983
W. G. Characklis, F. L. Roe, M. H. Turakhia, and N. Zelver Jul. 1983 181 p refs
(Contract N00014-80-C-0475)
(AD-A131084) Avail: NTIS HC A09/MF A01 CSCL 13/10

This report describes results of laboratory experiments conducted to determine the influence of fouling biofilm formation on heat transfer resistance and fluid frictional resistance. The research is directed at problems of power generation on ship board. GRA

N84-10727# Brookhaven National Lab., Upton, N. Y.
THE DESIGN AND OPERATION OF SYSTEMS FOR INHALATION EXPOSURE OF ANIMALS
Robert T. Drew 1982 43 p refs
(Contract DE-AC02-76CH-00016)
(DE83-015388; BNL-33103) Avail: NTIS HC A03/MF A01

The development, design, and operation of systems for exposure of animals to airborne pollutants are discussed. The most significant point is that there are no set ways to perform inhalation studies. Many methods and techniques are acceptable. The specific protocol developed depends on the objectives of the study or the questions being asked. Many chamber designs and operations are suitable to answer specific questions. The most important point for an investigator to understand is the limitations of the system he has chosen. A wide variety of chamber shapes and sizes are currently in use and are appropriate under certain circumstances. In conclusion, those beginning to design facilities or chambers are encouraged to consult with those who are currently operating such systems prior to beginning construction. DOE

N84-10728# Oak Ridge National Lab., Tenn.
NONPARAMETRIC ESTIMATION OF THE DISTRIBUTION OF TIME TO ONSET FOR SPECIFIC DISEASES IN SURVIVAL/SACRIFICE EXPERIMENTS
B. W. Turnbull and T. J. Mitchell Jul. 1983 41 p refs
(Contract W-7405-eng-26)
(DE83-013726; ORNL/CSD-111) Avail: NTIS HC A03/MF A01

The analysis of an animal survival/sacrifice experiment in which it is desired to investigate the incidence of a particular disease of interest is considered. It is assumed that the disease is irreversible and detectable only at death, e.g., via a necropsy. Each observation is of one of three types, namely, death caused by the disease, death by competing cause (e.g., sacrifice) with the disease present, and death with the disease absent. A two dimensional EM algorithms is proposed to obtain the nonparametric maximum likelihood estimates of the distribution G(t) of the time to onset (Y) and the distribution F(t) of the time to death (X) from the disease. A slight modification of the algorithm enables the construction of likelihood based confidence intervals of F(t), G(t), the medians of X and Y and other functions of interest. The methods are illustrated using data from an experiment with laboratory mice in which the disease of interest is reticulum cell sarcoma. DOE

N84-10729# Oak Ridge National Lab., Tenn. Biology Div.
THE RELEVANCE OF EXPERIMENTAL ANIMAL STUDIES TO THE HUMAN EXPERIENCE
R. J. M. Fry 1982 24 p refs Presented at the Conf. on Radiation Carcinogenesis: Epidemiology and Biol. Significance, Washington, D.C., 24 May 1982
(Contract W-7405-eng-26)
(DE83-014053; CONF-8205170-2) Avail: NTIS HC A02/MF A01

Animal experiments are being used to examine a number of physical and biological factors that influence risk estimations though not usually in coordination with epidemiologists. It is clear that the different mechanisms involved in different types of tumors are reflected in the diversity of dose-response relationships. The forms of the dose-response relationships are influenced by both the initial events and their expression. Evidence is accumulating that many initiated cells do not get expressed as overt cancers and host factors may play a major role in the expression of potential tumor cells. There is a need for information about the relationship of the natural incidence and susceptibility to radiation induction for more tumor types. Such experiments will help answer the question of which risk estimate models are appropriate for different tumor types and can be carried out on animals. Perhaps because of the importance of host factors risk estimates as a percentage of the natural incidence appear to be similar for human beings and mice for a small number of tumor types. DOE

N84-10730# Idaho Univ., Moscow. Water and Energy Resources Inst.
AQUACULTURE TECHNIQUES: A PRODUCTION FORECASTING MODEL FOR AQUACULTURE SYSTEMS
P. C. Downey and G. W. Klontz Mar. 1983 82 p refs
(Contract DI-14-34-0001-0216)
(PB83-221713; W83-03318; OWRT-A-063-IDA(2)) Avail: NTIS HC A05/MF A01 CSCL 06C

Computer implementation of the mathematical models of quantitative relationships in aquaculture systems is a dynamic process which provides a conceptual framework for understanding systems behavior. These models can provide useful information on variable significance to systems functioning. This computer implemented mathematical model addresses one of the significant limitations of aquaculture systems management, namely, production forecasting, by providing a method of using technology to predict Allowable Growth Rate (AGR). GRA

N84-10731# Health Effects Research Lab., Research Triangle Park, N. C. Genetic Bioassay Branch.
EVALUATION OF MOTOR VEHICLE AND OTHER COMBUSTION EMISSIONS USING SHORT-TERM GENETIC BIOASSAYS
Joellen Lewtas Jul. 1983 20 p refs
(PB83-233270; EPA-600/D-83-078) Avail: NTIS HC A02/MF A01 CSCL 06F

Short term genetic bioassays were useful in evaluating unregulated organic combustion emissions from motor vehicles. Identification of mutagens and carcinogens in complex exhaust emissions was greatly facilitated by the use of bioassay directed factionation and characterization methods. It is also possible to evaluate the effect of fuels, engine types, and control technologies on the rates of mutagenic emissions from motor vehicles. Greater differences in the rate of mutagenic emissions were observed between different engines (e.g., diesel vs. gasoline) and control technologies (e.g., with and without catalyst) than between different

fuels. A comparative evaluation of various combustion sources indicates that motor vehicle emissions make a major contribution to the mutagenicity observed in ambient air. GRA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-10732*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PHYSIOLOGICAL EFFECTS OF SIMULTANEOUS EXPOSURES TO HEAT AND VIBRATION Ph.D. Thesis - California Univ., Berkeley
Wil Aaron Spaul Sep. 1983 181 p refs
(NASA-TM-84400; A-9458; NAS 1.15:84400) Avail: NTIS HC A09/MF A01 CSCL 06S

Determination of the effects of exposure to vibration on the body's ability to handle heat stress, and, if so, identification of the specific vibration parameters (frequency and intensity) for both whole-body (wbv) and segmental-body vibration (sbv) that would have the most detrimental effect on the body's ability to maintain thermal homeostasis were studied. Rectal and skin temperatures, heart rates, localized sweat rates, arm-segment blood perfusion rates, respiration rates, oxygen uptakes, and respiratory exchange ratios were measured in six men (22 to 33 yr) during simultaneous exposures to heat and vibration - either wbv or sbv, and during a heated 50 min recovery period. The heat conditions were T (sub db) = 43.5 + or - 0.5 C (mean + or S.E.M.), and RH = 20 + or - 4%. All vibration exposures were divided into two exposure conditions - identical frequencies but at a high intensity (HI) and a low intensity (LI) level. The HI wbv exposure was for 25 min/day at 5 Hz, 0.37 g-rms; 10 Hz, 0.46 g-rms; 16 Hz, 0.72 g-rms; 30 Hz, 1.40 g-rms; 80 Hz, 3.70 g-rms. The LI wbv exposure was for 2.5 hr/day at the same frequencies but at the following accelerations: 0.14 g-rms; 0.18 g-rms; 0.28 g-rms; 0.55 g-rms; 1.44 g-rms. During the sbv the subject stood and grasped a vibrating, in the Z-axis, hand grip with both hands. Author

N84-10733# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PRELIMINARY INVESTIGATION OF VARIATION IN SOME DARK ADAPTATION ASPECTS FOR POSSIBLE RELEVANCE TO MILITARY HELICOPTER AIRCREW
Eric Donaldson Jun. 1983 91 p refs
(AF Proj. 7184)
(AD-A130231; AFAMRL-TR-83-053) Avail: NTIS HC A05/MF A01 CSCL 05/10

The variability in night visual capacity of military aircrew may be relevant to task selection especially for low level night operation of the light observation helicopter. The experimental objective was to assess the extent of variation threshold for spatial frequencies and in the time to recovery of dark adaptation after a standard light exposure simulating a flare illumination. The subjects were 11 volunteers, five of whom were dark adapted for a period of 30 minutes. The level of adaptation was measured with an adaptometer which had the capability of presenting the stimulus at several spatial frenquencies. A brief exposure to the simulated flare illumination was immediately followed by assessment of the effect on dark adaptation and time for recovery. Considerable variation was demonstrated in the rate and threshold levels of dark adaptation for light and for resolution of several spatial frequencies. Following the simulated flare exposure of 0.8 mL for 90 seconds, most subjects attained a threshold level for light within 30 seconds and there was no evidence of a recovery effect in the curves of the threshold luminance for resolution of a 6.25 cycles per degree grating. Marked differences in the threshold levels and in the spread of the subjects' estimations were clearly evident. GRA

N84-10734# Naval Biodynamics Lab., New Orleans, La. Bureau of Medicine and Surgery.
EFFECTS OF IMPACT ACCELERATION ON SOMATOSENSORY EVOKED POTENTIALS
Michael D. Berger and Marc S. Weiss Apr. 1983 65 p refs
(AD-A130280; NBDL-83R002) Avail: NTIS HC A04/MF A01 CSCL 06/19

In order to test and evaluate impact protection devices, an impact-injury model for restrained humans in a crash environment must be developed. Disruption of the functioning of the central nervous system (CNS) is an important consequence of impact injury involving the head and neck, and is an important consideration in the development of a useful impact-injury model. Ultimately, neurophysiological criteria for functional injury of the CNS are desired. The main purpose of the experiments reported here is to identify some of the measures of CNS function which may provide the basis for establishing such criteria. In these experiments, eight unanesthatized Rhesus monkeys, with torsos restrained in a seated position, and with head and neck free to move, were subjected to peak sled accelerations in the -X direction ranging from 42 m/s sq. second to 963 sq. second. The results of these analyses indicate that neurophysiological indices of injury may include: increases in latencies of the cervical Somatosensory evoked potentials (SEP) peaks exceeding 2.5%; large changes in the amplitude of the cervical SEP; changes in ripples on the cortical primary SEP; and substantial and persistent changes in the surface-positive cortical primary SEP. In particular, analysis of shifts in latency of the cervical SEP suggests the possibility of an injury threshold in the vicinity of 700 - 800 sq. second. Smaller shifts in latency occurring near 600 sq. second may indicate a pre-injury condition. GRA

N84-10735# Army Research Inst. of Environmental Medicine, Natick, Mass. Exercise Physiology Div.
THE ENERGY COST AND HEART RATE RESPONSE OF TRAINED AND UNTRAINED SUBJECTS WALKING AND RUNNING IN SHOES AND BOOTS
Bruce H. Jones, Michael M. Toner, William L. Daniels, and Joseph J. Knapik 1983 21 p refs
(AD-A131420; USARIEM-M-37/83) Avail: NTIS HC A02/MF A01 CSCL 06/19

To determine the difference in the energy cost of walking and running in a lightweight athletic shoe and a heavier boot, fourteen male subjects (6 trained and 8 untrained) had their oxygen uptake (VO2) measured while walking and running on a treadmill. They wore each type of footwear, athletic shoes of the subjects' choice (average weight per pair = 616g), and leather military boots (average weight per pair = 1776g) at 3 walking speeds. (4.0, 5.6 and 7.3 km/ h) and 3 running speeds (8.9 10.5 and 12.1 km/h). The trials for running were repeated at the same three speeds with the subjects wearing shoes and these shoes plus lead weights. The weight of the shoes plus the lead weights was equal to the weight of the subjects' boots. The VO2 values with boots were significantly (p .05) higher (5.9 to 10.2 percent) at all speeds, except the slowest walk, 4.0 km/h. also, VO with shoes plus lead weights were significantly (p.05) higher than shoes alone. Weight alone appeared to account for 48-70% of the added energy cost of wearing boots. The relative energy cost (VO2m ml/kg/min) of trained and untrained suggests were the same at all speeds, but heart rates for the untrained were significantly higher (p.05) in both shoes and boots except at the slowest walking speed (4.0 km/h). These data indicate that energy expenditure is increased by wearing boots. A large portion of this increase may be attributed to weight of footwear. GRA

N84-10736# Naval Health Research Center, San Diego, Calif.
A SURVEY OF BODY FAT CONTENT OF U.S. NAVY MALE PERSONNEL Interim Report
J. A. Hodgdon and E. J. Marcinik Feb. 1983 16 p refs
(AD-A131500; NAVHLTHRSCHC-83-4) Avail: NTIS HC A02/MF A01 CSCL 06/5

In response to DOD directive 1308.1, the United States Navy has released a new instruction, OPNAVINST 6110.1B, covering

health and physical readiness. This instruction changes the standards for weight control from height/weight tables to a 22% body fat (%BF) standard for men, estimated from neck and abdominal circumferences. In order to determine the possible impact of this change, height, weight, age, neck circumference and abdominal circumference measures were collected on a sample of 986 male U.S. Navy personnel: 174 recruits, 309 recruit staff, 436 auxiliary vessel crew members, and 67 submarine crew members. Percent body fat was determined using the methods described in 6110.1B. Compliance with heigh/weight standards was assessed using the table in 6110.1B. The mean %BF for the survey sample was 16.8% (+ or - 5.3). Adjusting for differences between age distribution of our sample and that of the total Navy male population, it is estimated that 15.8% (+ or - 1.2) of the Navy male population will exceed the 22% BF standard. For the survey sample, 16.5% of the personnel exceeded the 22% standard while 15.4% exceeded the height/weight standards. This suggests changing to the %BF standard will not greatly effect the number of personnel on weight control programs. GRA

N84-10737# Army Research Inst. of Environmental Medicine, Natick, Mass. Altitude Research Div.

PREVENTION OF ACUTE MOUNTAIN SICKNESS BY DEXAMETHASONE

T. Scott Johnson (Beth Israel Hospital), Paul B. Rock, Charles S. Fulco, Laurie Trad, Richard F. Spark, and John T. Maher 27 Jul. 1983 20 p refs

(DA Proj. 3E1-62777-A-879)

(AD-A131533; USARIEM-M-38/83) Avail: NTIS HC A02/MF A01 CSCL 06/5

Acute mountain sickness (AMS) is a syndrome which occurs when unacclimatized individuals rapidly ascend to high altitude. It is postulated that cerebral edema causes the symptoms of AMS. Since dexamehtasone is useful in treating some forms of cerebral edema, we investigated its role in the prevention of AMS. Utilizing a double-blind, crossover design, eight young men were exposed to a simulated altitude of 4570 m (15,000 ft) on two occasions. On one occasion, they received dexamethasone (4 mg every 6 h) for 36 h before and throughout the 42 h exposure. On the other, they received a placebo. Presence of AMS symptoms was established by a questionnaire and a clinical interview. Indices of Cerebral and respiratory symptoms(AMS-C and AMS-R, respectively) were derived from the questionnaire. During the clinical interview, subjects were scored from 0 (no symptoms) to 3 (severe symptoms). Dexamethasone significantly reduced AMS symptoms. AMS-C decreased from (mean + or - SE) 1.09 + or - 0.18 to 0.26 + or - 0.08 and AMS-R decreased from 0.64 + or - 0.09 to 0.31 + or - 0.06 during dexamethasone treatment (both p0.0001). As judged by clinical interview, symptom score decreased from 1.10 + or - 0.11 to 0.28 + or - 0.07 (p0.0001). We conclude that dexamethasone is effective in preventing the symptoms of AMS. GRA

N84-10738# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.

MEASUREMENT OF LUNG FUNCTION USING THE MAGNETOMETER SYSTEM Final Report

D. L. Vawter and J. D. Humphrey Jul. 1983 70 p refs

(Contract N00014-81-K-0126)

(AD-A130841) Avail: NTIS HC A04/MF A01 CSCL 06/16

In the last few years, several investigators have studied the idea of estimating lung volume by measuring the dimensional changes of the chest and abdomen during respiration. The prospect of being able to know the value of lung volume from information obtained noninvasively was intriguing. The most common method of measuring the dimensional changes is to use magnetometer pairs. For the purpose of this report, it is sufficient to note that magnetometer pairs generate a voltage that is proportional to the change in their separation distance. The relationship between voltage and the change in separation distance is essentially linear over the separation distances measured in this study. GRA

N84-10739# Concordia Univ., Montreal (Quebec). Dept. of Electrical Engineering.

CERVICAL SPLINE ANALYSIS FOR EJECTION INJURY PREDICTION Final Research Report, Oct. 1980 - Sep. 1982

S. Gracovetsky, H. F. Farfan (St. Mary's Hospital), and Christopher D. Helleur 30 Nov. 1982 99 p refs

(Grant AF-AFOSR-0012-81; AF Proj. 2312)

(AD-A131081; AFOSR-83-0590TR) Avail: NTIS HC A05/MF A01 CSCL 06/19

We have developed a sagittal plane mathematical model for the cervical spine (including T6-T1, C7-C1 and skull). In our model the moments due to the weight of the head and neck and the effect of external forces are balanced by forces generated internally by muscle, ligament, and intervertebral joint. With this formulation, the problem is to find a method for distributing the moment between muscle and ligament. Our calculations show that the mathematical representation of physiological behavior demands that stress be minimized at the intervertebral joint. It is interesting to note that Wolff has observed that bone architecture at the microscopic level responds to stress. Our findings suggest the system as a whole is controlled by stress. This model was then subjected to simulation in order to determine the maximum acceleration that the cervical spine would take for different postures. We found that the maximum supportable acceleration (i.e. acceleration that would result in any cervical component reaching 2/3 of its limit) depends upon the neck posture and orientation vis-a-vis the acceleration vector. GRA

N84-10740# EEG Systems Lab., San Francisco, Calif.

NEUROCOGNITIVE PATTERN ANALYSIS Annual Technical Report, 1 Nov. 1982 - 31 Oct. 1983

Alan S. Gevins, Brian A. Cutillo, Steven L. Bressler, Joseph C. Doyle, Robert S. Tannehill, Gerald M. Zeitlin, and Benjamin H. Bonham Aug. 1983 84 p refs

(Contract N00014-83-C-0022)

(AD-A131302; ONR-83-AE) Avail: NTIS HC A05/MF A01 CSCL 05/10

Completed and ongoing studies of neurocognitive processes using the new technique of Neurocognitive Pattern (NCP) Analysis are reported. The pilot and formal recording phases of a bimanual visuomotor experiment are described, as well as work on the elimination of scalp-muscle and eye-movement artifiacts from single-trial brain-potential data. GRA

N84-10741# Brookhaven National Lab., Upton, N. Y.

FOURIER-PROCESSED IMAGES OF DYNAMIC LUNG FUNCTION FROM LIST-MODE DATA

I. G. Zubal, R. W. Rowe, I. Bizais, H. Susskind, G. W. Bennett, and A. B. Brill 1983 5 p refs Presented at the 5th Ann. Conf. of IEEE/Eng. in Med. and Biol. Soc., Columbus, Ohio, 10 Sep. 1983

(Contract DE-AC02-76CH-00016)

(DE83-013276; BNL-33138; CONF-830994-1) Avail: NTIS HC A02/MF A01

Time and volume correlated amplitude and phase images are computed from nuclear medical ventilation studies and for dynamic transmission scans of the lungs. This is made possible by a hardware interface and data acquisition system, developed in-house, allowing camera events and multiple ancillary physiological signals (including lung volume) to be acquired simultaneously in list mode. The first harmonic amplitude and phase images are constructed on an event by event basis. These are computed for both equal time and equal lung volume increments. Time and volume correlated Fourier images for ventilation studies have shown details and functional structures not usually seen in conventional imaging techniques. Processed transmission scans show similar results compared to ventilation images. DOE

N84-10742# National Center for Devices and Radiological Health, Rockville, Md.

PERFORMANCE OF A NEW 916 MHz DIRECT CONTACT APPLICATOR WITH REDUCED LEAKAGE, A DETAILED ANALYSIS Final Report

Gideon Kantor and Donald M. Witters, Jr. Apr. 1983 29 p refs Submitted for publication
(PB83-226621; HHS/PUB/FDA-83-8100; FDA/NCDRH-83/42) Avail: NTIS HC A03/MF A01 CSCL 06L

The paper demonstrates the feasibility of a direct contact diathermy applicator operating at 915 MHz. The design is a circular waveguide internally loaded with two orthogonal pairs of forward ridges to obtain circular polarization and two rear ridges with a probe to excite the guide. Two designs were tested: a 15-cm diameter applicator with one annular choke covered with a microwave absorber and a 25-cm diameter applicator with two additional concentric chokes to limit radiation leakage. In delivering a thermally effective specific absorption rate to a planar phantom, leakage levels were less than 5 mW/sq. cm for applicators in direct contact with the phantom. If there is a small spacing between these applicators and planar phantoms, the net power and associated leakage is excessive. Author (GRA)

N84-10743# Environmental Monitoring and Support Lab., Research Triangle Park, N. C. Data Management and Analysis Div.
RECENT ADVANCES IN EPA'S ENVIRONMENTAL PROGRAM MONITORING AND METHODS DEVELOPMENT RESEARCH
Robert H. Jungers Jul. 1983 14 p refs
(PB83-231209; EPA-600/D-83-085) Avail: NTIS HC A02/MF A01 CSCL 06E

Several areas of advanced research related to sampling, analysis, and human exposure assessment of exhaust emission in ambient air were developed. These include studies of methods for volatile organic compounds and the development and application of personal exposure monitors in screening for polynuclear aromatics (PNA's) and carbon monoxide. These methods for screening PNA's are fast, economical and accurate. The more expensive and time consuming traditional methods of analysis may be judiciously applied to those samples which the screening methods indicate are high in PNA's. Carbon monoxide, an emission product directly related to automobile emissions, is being monitored using personal exposure monitors in urban scale studies to obtain data on population exposures on a real time basis. GRA

N84-10744# Research Triangle Inst., Research Triangle Park, N.C.
PERSONAL EXPOSURE TO VOLATILE ORGANICS AND OTHER COMPOUNDS INDOORS AND OUTDOORS: THE TEAM (TOTAL EXPOSURE ASSESSMENT METHODOLOGY) STUDY
Lance A. Wallace, Edo D. Pellizzari, Tyler D. Hartwell, Charles Sparacino, and Harvey Zelon Jul. 1983 35 p refs
(Contract EPA-68-03-3679)
(PB83-231357; EPA-600/D-83-082) Avail: NTIS HC A03/MF A01 CSCL 06E

A methodology for measuring individual human exposure to toxic substances was developed. Methods for estimating body burden with the use of biological measurements were also developed. All significant pathways of exposure are addressed. Sampling and analytical protocols were tested for volatile organic compounds, organochlorine pesticides, metals, and polyaromatic hydrocarbons. Exposure through air and drinking water and excretion rates through inhaled breath were measured for a statistically valid sample population. It was determined that personal air median concentrations ranged from 40 to 320% higher than outdoor fixed air concentrations. Correlations between personal and outdoor samples were poor. GRA

N84-10745# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
PROBABILISTIC MODEL FOR ASSESSING TIME-VARYING CONTAMINANT LEVELS
Cynthia Whitney 1983 27 p refs
(Contract PHS-HSM-99-72-18)
(PB83-232108) Avail: NTIS HC A03/MF A01 CSCL 06J

The health and well being of workers in an industrial environment that emits respirable contaminants depends in part on an effective program to monitor the concentration of airborne pollutants and compare them to given standards. The analysis described herein is aimed at some problems faced by an inspector determining exposure levels and making decisions of over-exposure/safe-exposure for industrial workers. There is at present an acute need for an approach to the monitoring problem that (1) is generally applicable to any industrial environment, (2) specifies the most efficient way to collect the data, (3) indicates how to assess the accuracy and repeatability of the results, and (4) reduces to a few simple rules of thumb, numerical tables or computer programs readily applicable by workers in the field. GRA

N84-10746# Rochester Univ., N. Y. Dept. of Medicine
MICROWAVES, HYPERTHERMIA, AND HUMAN LEUKOCYTE FUNCTION Final Report, Aug. 1979 - Jun. 1982
Norbert J. Roberts, Jr., Shin-Tsu Lu, and Sol M. Michaelson Jul. 1983 24 p refs
(Contracts EPA-R-808039; EPA-R-806390; F33615-81-K-0616; Grant AF-AFOSR-0111-80)
(PB83-225375; EPA-600/1-83-008) Avail: NTIS HC A02/MF A01 CSCL 06R

Studies were performed to determine whether human leukocytes are affected by exposure to microwave energies that equal or even exceed current safety standard recommendations. There were no detectable effects on viability or function of human mononuclear leukocytes resulting from exposure to microwave energy at specific absorption rates up to 4 mW/ml. In contrast to studies in other laboratories, the results were highly reproducible and provided no evidence that current safety standard recommendations are inappropriate insofar as leukocyte function is concerned. GRA

N84-10747# Health Effects Research Lab., Research Triangle Park, N. C.
RADIOFREQUENCY RADIATION EXPOSURE FOR BIO-EFFECTS RESEARCH AT THE HEALTH EFFECTS RESEARCH LABORATORY, RESEARCH TRIANGLE PARK, NORTH CAROLINA
Joseph S. Ali and Claude Weil Mar. 1983 64 p refs
(PB83-229591; EPA-600/2-83-018) Avail: NTIS HC A04/MF A01 CSCL 06R

The multi-user radiofrequency radiation exposure facilities for bio-effects research is described. Four facilities are (1) a 100 MHz CW exposure system, (2) a 2450 MHz CW exposure system, (3) a 2450 MHz AM exposure system, and (4) an X-band pulsed RF exposure system. The individual facility descriptions include construction details, specifications, photographs, circuit drawings and block diagrams. All of the facilities incorporate environmental control systems and three have RF power-level regulation. GRA

N84-10748# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES. USER'S GUIDE TO THE RTECS COMPUTER TAPE Annual Report
Rodger L. Tatken and Richard J. Lewis Jan. 1983 79 p
(Contract PHS-NIOSH-210-81-8101)
(PB83-223172; DHEW/DF-83/004A) Avail: NTIS HC A05/MF A01 CSCL 06T

The User's Guide defines the record layouts and describes the types of data contained in the computer tape. The Guide defines all relevant terms and contains the introductory material and tables. The data file contains 218,746 entries (59,224 are names of unique chemicals with their associated toxicity data and 159,522 are synonymous names) and provides basic information on their known toxic and biological effects. GRA

N84-10749# SRI International Corp., Menlo Park, Calif.
DIRECT BIOLOGICAL EFFECTS OF INCREASED ATMOSPHERIC CARBON DIOXIDE LEVELS
Marilyn K. Bland, Howard C. Baley, and Michael J. Lipsett Jun. 1983 136 p refs
(Contract EPA-68-02-3716)
(PB83-224360; EPA-600/6-83-001) Avail: NTIS HC A07/MF A01 CSCL 06T

The likely biological nonclimatic, direct effects of carbon dioxide

(CO2) on terrestrial and aquatic ecosystems and on human health are assessed. It summarizes the literature on the direct effects of rising CO2 levels on the biosphere is summarized and technical information needs about direct biological effects of rising CO2 levels are identified. The environmental and human health implications of these effects were evaluated in the context of four scenarios describing possible carbon dioxide levels. Six categories of CO2 control options: (1) increasing the rate of carbon fixation or mass transfer, (2) changing the fuel use strategy, (3) changing energy use patterns, (4) using emission source controls (5) using institutional controls to adapt society, and (6) implementing exotic strategies are discussed. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-10750# Naval Personnel Research and Development Center, San Diego, Calif.
EFFECTS OF BEHAVIORAL OBJECTIVES AND INSTRUCTIONS ON EARNING A CATEGORY TASK Special Report, FY 82
Paula J. Konoske and John A. Ellis May 1983 14 p refs
(ZF66512001)
(AD-A130386; NPRDC-SR-83-33) Avail: NTIS HC A02/MF A01 CSCL 05/9

This study compares the effects of behavioral objectives and explicit instructions on learning a category task. Subjects were assigned to one of four groups: a read-only control group, a standard Navy behavioral objective group, a revised behavioral objective group, and an instructions group. Results of a recall test and a classification test showed a significant difference in group performance. The data indicated that giving students instructions or behavioral objectives that have been revised so that they are clear to the student facilitates recall and classification performance more than giving nonspecific behavioral objectives. The instructional implications are that students should be given explicit instructions or behavioral objectives that use familiar terminology and consist of specific information about the nature of the testing situation when learning from text. Author (GRA)

N84-10751# Colorado Univ., Boulder. Center for Research on Judgment and Policy.
DIRECT COMPARISON OF INTUITIVE, QUASI-RATIONAL AND ANALYTICAL COGNITION
Kenneth R. Hammond, Robert M. Hamm, Janet Grassia, and Tamra Pearson Jun. 1983 84 p refs
(Contract N00014-77-C-0336)
(AD-A130273; CRJP-248) Avail: NTIS HC A05/MF A01 CSCL 05/10

The relative efficacy of intuitive and analytical cognition in analytically competent persons was directly compared. More subjects performed best in the intuitive mode when inconsistency was removed from their judgments, an indication that the subjects possessed implicit knowledge that they did not utilize in the analytical mode. More subjects made larger errors in the analytical mode than in the intuitive mode. Subjects' confidence was generally inappropriately placed. Author (GRA)

N84-10752# Air Force Human Resources Lab., Brooks AFB, Tex. Plans and Programs Office.
FLYING TRAINING R&D (RESEARCH AND DEVELOPMENT) AT THE AIR FORCE HUMAN RESOURCES LABORATORY Final Technical Report
Herbert J. Clark and Kenneth W. Potempa Jun. 1983 10 p refs Presented at the Aviation Psychology Symp., Columbus, Ohio, 27-29 Apr. 1983
(AD-A130250; AFHRL-TP-83-24) Avail: NTIS HC A02/MF A01 CSCL 05/9

This paper describes the Air Force Human Resources Laboratory and its research and development (R&D) programs in Flying Training. Studies in flight simulation, part-task trainer development, performance measurement, and pilot selection are described. R&D issues in Flying Training which merit continued attention are discussed, and opportunities for participation in Air Force sponsored R&D programs by universities and industrial organizations are briefly outlined. Author (GRA)

N84-10753# Midwest Research Inst., Kansas City, Mo.
TASK VALIDATION FOR STUDIES ON FRAGMENTED SLEEP AND COGNITIVE EFFICIENCY UNDER STRESS Final Report, 1 May 1980 - 30 Sep. 1982
Charles Graham and Harvey D. Cohen Nov. 1982 98 p
(Contract DAMD17-80-C-0075; DA Proj. 3E1-62777-A-879)
(AD-A130260; MRI-2007-E) Avail: NTIS HC A05/MF A01 CSCL 06/19

A computer gaming approach was used to create a new type of automated performance task (STAR). The task unobtrusively measures multiple cognitive skills and risk-taking behavior under various stress and workload conditions. A training manual and protocol were developed, and performance criteria established. Measurement reliability and performance under different task difficulty levels and crisis conditions were assessed. STAR is shown to be a sensitive task which promises to reliably measure major aspects of human function under a variety of conditions. Author (GRA)

N84-10754# Naval Biodynamics Lab., New Orleans, La. Bureau of Medicine and Surgery.
EFFECTS OF HEAD IMPACT ACCELERATION ON HUMAN PERFORMANCE: OVERVIEW AND PRELIMINARY BATTERY IDENTIFICATION
Alvah C. Bittner, Jr., James P. Shortal, III, and Mary M. Harbeson May 1983 18 p refs
(AD-A130286; NBDL-83R004) Avail: NTIS HC A02/MF A01 CSCL 05/10

A review of the human performance effects of impact acceleration was conducted as part of an effort to assemble an experimental test battery. Tasks were designated for inclusion only if suitable for repeated measures applications and sensitive to closed-head impact acceleration. Two human performance tasks which met these criteria were identified after separate reviews of experimental and clinical research. In addition, three tasks sensitive to impact effects and potentially suitable for repeated measures applications were also identified. A third category of tasks which are suitable for repeated measures research but have not yet been shown to be sensitive to impact acceleration have been identified in other reports from this laboratory, but are beyond the scope of the present study. Short-term Consonant Memory, Adaptive Serial Addition, and Adaptive Visuospatial Judgement tasks were determined to be sensitive candidate measures with potential for repeated measures applications and were recommended for development. Choice Reaction Time (CRT) and Manikan Spatial Orientation Tasks were recommended for inclusion in an impact acceleration test battery for current applications. GRA

N84-10755# Rice Univ., Houston, Tex. Dept. of Psychology.
A CRITICAL ANALYSIS OF THE USES OF MULTIPLE REGRESSION IN THE STUDY OF HUMAN JUDGEMENT
Shanta P. Kerkar Jul. 1983 48 p refs
(Contract N00014-82-C-0001; NR Proj. 197-074)
(AD-A131224; TR-83-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

The present paper represents an effort toward integration and extension of existing knowledge in one area of the decision-judgment field. It analyzes the widespread use that is being made of the multiple regression (MR) paradigm in judgement research, distinguishes two major orientations apparent in that work, and suggests ways to integrated and extend them in the interest of making the resulting data more useful. GRA

N84-10756# Syracuse Univ., N. Y.
EXTENDED DEVELOPMENT PROCEDURE EDeP USER'S MAN-

UAL Final Report
Charles M. Reigeluth, Philip Doughty, Fulya Sari, Charles J. Powell, Linda Frey, and Jack Sweeney Nov. 1982 67 p refs Sponsored by Army
(AD-A131381) Avail: NTIS HC A04/MF A01 CSCL 05/9

This is a reference Manual (not a training manual) organized to be appropriate for use at the level of knowledge of the user about instructional design. It provides the essential core of design prescriptions for people who do not have much experience or background in design. It is organized in chronological order and takes the form of the steps that are keyed to, and should be integrated into, the steps laid out in the (IPISD)(Interservice Procedures for Instructional Systems Development). This User's Manual and its companion EDeP Advanced Reference Manual outline and describe such macro level activities as selecting and sequencings, then the major instructional requirements for each skill and knowledge that needs to be taught and the planning of major components or strategies for meeting those requirements. Selection of the most appropriate instructional approach (or combination of approaches) for each skill and knowledge follows. Necessary materials and instructor's manual are then developed in such a way as to utilize the components that were prescribed earlier. GRA

N84-10757# California Univ., San Diego, La Jolla. Center for Human Information Processing.
REPRESENTATION IN MEMORY
David E. Rumelhart and Donald A. Norman 7 Jun. 1983 132 p refs Sponsored in part by the System Development Foundation
(Contract N00014-79-C-0323; NR Proj. 667-437)
(AD-A130662; CHIP-116; REPT-8302-ONR) Avail: NTIS HC A07/MF A01 CSCL 05/10

This paper provides a review of work on the representation of knowledge from within psychology and artificial intelligence. The work covers the nature of representation, the distinction between the represented world and the representing world, and significant issues concerned with propositional, analogical, and superpositional representations. Major controversies within psychology - such as distinctions between declarative and procedural representation, propositional and analogical representation, and the nature of visual images - are analyzed and found not to reflect fundamental disagreements. Author (GRA)

N84-10758# Boeing Aerospace Co., Seattle, Wash.
INTEGRATED CUING REQUIREMENTS (ICR) STUDY: FEASIBILITY ANALYSIS AND DEMONSTRATION STUDY Final Report
Richard Farrell and Richard Barker Williams AFB, Ark. AFHRL Jun. 1983 53 p
(Contract F33615-79-C-0014; AF Proj. 6114)
(AD-A131039; AFHRL-TP-82-25(1)) Avail: NTIS HC A04/MF A01 CSCL 05/9

The goal of the Integrated Cuing Requirements (ICR) Study was to consolidate and synthesize existing human sensory/perceptual data, principles and models in a manner which would make this information readily accessible and useful to the community of aircrew training device (ATD) design engineers. There exists an extensive body of research literature on human perception which could potentially be of value in the specification, design, and evaluation of aircrew training devices. The data in this domain are distributed among numerous different publications and are written in the specialized terminology of perceptual psychology. Consequently, this information is not generally accessible to ATD engineers. The goal of the ICR study was to extract and consolidate the relevant data into an accessible format and to provide, where feasible, a synthesis of the literature which included recommendations relevant to equipment design. The intended output of this activity was (1) an ICR Data Base containing the available sensory/perceptual data in a form useful for specification and design purposes, and (2) an ICR Users Guide to facilitate access to the data by the ATD engineer. GRA

N84-10759# Stanford Univ., Calif. Dept. of Psychology.
REPRESENTATIONS OF PERCEPTIONS OF RISKS
Eric J. Johnson (Carnegie-Mellon Univ.) and Amos Tversky Jun. 1983 36 p refs Sponsored in part by NSF
(Contract N00014-79-C-0077; NR Proj. 197-058)
(AD-A131443) Avail: NTIS HC A03/MF A01 CSCL 05/10

The perceptions of risks (e.g., diseases, accidents, natural hazards) is investigated using a multi-task, multi-model approach. We studied the proximities among 18 risks induced by three tasks: judgment of similarity, conditional prediction and dimensional evaluation. The comparative judgments (similarity and prediction) were reasonably close but the dimensional evaluation did not correlate highly with either similarity or prediction. Similarity judgments and conditional predictions appear to be represented best by tree models, which are based on discrete features, while the dimensional evaluations are better explained by spatial models, such as multidimensional scaling and factor analysis. We discuss the implications of these results for the study of mental representation and for the analysis of risk perception. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-10760# Army Aeromedical Research Lab., Fort Rucker, Ala. Biodynamics Research Div.
IMPACT AND VIBRATION TESTING OF A MODIFIED UH-1 CREW SEAT Final Report
Dennis F. Shanahan, Joseph L. Haley, John C. Johnson, John H. Wells, and Heinrich Knoche (German Air Force, Bonn) Jun. 1983 85 p refs
(DA Proj. 3E1-62777-A-878)
(AD-A130279; USAARL-83-10) Avail: NTIS HC A05/MF A01 CSCL 01/3

The German Air Force has developed a modified UH-1 pilot seat designed to improve comfort by increasing support to the thigh and lower back, providing better vibration dampening and increasing cold weather comfort. This seat was tested for vibration dampening, pilot acceptance, and impact tolerance in a side-by-side test with the standard UH-1 seat. The modified seat is more comfortable than the standard UH-1 seat. The modified seat provides better impact protection than the standard seat, provided that the seat frame and restraint system do not tear loose. The modified seat does not provide better vibration dampening than the standard UH-1 seat. Author (GRA)

N84-10761# Naval Coastal Systems Lab., Panama City, Fla.
DESIGN GUIDELINES FOR CARBON DIOXIDE SCRUBBERS
M. L. Nuckols, A. Purer, and G. A. Deason May 1983 72 p refs
(AD-A130459; NCSC-TECH-MAN-4110-1-83) Avail: NTIS HC A04/MF A01 CSCL 06/11

Design data and guidelines are presented to help predict the performance of axial flow carbon dioxide canister designs using alkali metal hydroxide absorbers. The design data are derived from a large series of laboratory tests conducted at the Naval Coastal Systems Center to isolate the effects of environmental and geometric parameters on canister absorption efficiency. Sample canister designs are considered to demonstrate the use of the derived data to predict effective canister life and pressure drop levels. Alternative techniques for the sorption of carbon dioxide are also reviewed. GRA

N84-10762# Naval Coastal Systems Center, Panama City, Fla.
DEVELOPMENT OF PASSIVE DIVER THERMAL PROTECTION SYSTEM
M. W. Lippitt, Jr. and M. I. Nuckols May 1983 65 p refs
(AD-A130685; NCSC-TM-378-83) Avail: NTIS HC A04/MF A01 CSCL 06/17

The development of the US Navy Passive Diver Thermal

protection system, designed to satisfy a majority of the air mode thermal protection requirements of fleet diving activities in cold water, is described. The requirements, the evolution of system design, the development and test of the various prototypes, and the system operational and performance evaluations are discussed. The final system demonstrated its ability to maintain a resting diver within acceptable thermal limits for 6 hours in 4.5 degrees C water. The protection system allows sufficient mobility to allow the diver to engage in typical special warfare activities such as helicopter cast and recovery, parachuting, boat cast and recovery, and long surface and underwater swims. GRA

N84-10763# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Control Dynamics Branch.
PROCEEDINGS OF THE 18TH ANNUAL CONFERENCE ON MANUAL CONTROL Interim Report
Frank L. George Jan. 1983 568 p refs Conf. held at Dayton, Ohio, 8-10 Jun. 1982
(AF Proj. 9991)
(AD-A131256; AFWAL-TR-83-3021) Avail: NTIS HC A24/MF A01 CSCL 05/8

This volume contains proceedings of the Eighteenth Annual Conference on Manual Control, held at Dayton, Ohio, June 8-10, 1982. These proceedings contain 43 of the 45 Conference papers, either as abstracts or complete manuscripts. Topics covered include: control and controller design, analysis and definition of display requirements, and integration of control and display considerations. GRA

N84-10764# Oak Ridge National Lab., Tenn.
INTERCOMPARISON OF STABLE-ELEMENT CONTENT OF FOODS BY STATISTICAL METHODS
H. M. Braunstein, D. J. Pack, and T. W. Oakes 1982 20 p refs Presented at the 16th Ann. Conf. on Trace Substance in Environ. Health, Columbia, Mo., 31 May 1982
(Contract W-7405-eng-26)
(DE83-014029; CONF-8205201-2) Avail: NTIS HC A02/MF A01

The concentrations of 40 elements, which were determined in each of 87 foods from 3 sources and in 7 food groups, were analyzed statistically to develop a basis for intercomparing the foods. Mean values of the elemental concentrations are given for each food group and for each source. The possibility of fingerprinting a food by examining the distribution of elements in it is explored by using a clustering procedure to isolate groups of foods that have similar ranking patterns. The source of a food as well as the extent of processing has a strong influence on its clustering pattern. DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-10765*# Bendix Corp., Teterboro, N. J. Flight Systems Div.
FEASIBILITY STUDY FOR A GENERALIZED GATE LOGIC SOFTWARE SIMULATOR Interim Report
John G. McGough Jul. 1983 105 p refs
(Contract NAS1-15946)
(NASA-CR-172159; NAS 1.26:172159) Avail: NTIS HC A06/MF A01 CSCL 09B

Unit-delay simulation, event driven simulation, zero-delay simulation, simulation techniques, 2-valued versus multivalued logic, network initialization, gate operations and alternate network representations, parallel versus serial mode simulation fault modelling, extension of multiprocessor systems, and simulation timing are discussed. Functional level networks, gate equivalent circuits, the prototype BDX-930 network model, fault models, identifying detected faults for BGLOSS are discussed. Preprocessor tasks, postprocessor tasks, executive tasks, and a library of bliss coded macros for GGLOSS are also discussed. N.W.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N84-10766# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY, NO. 208
5 Oct. 1983 62 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-84474) Avail: NTIS HC A04

Abstracts and articles addressing various topics in applied and biological sciences are presented. Some specific areas addressed include computer aided design of aircraft wings, information systems, organ transplants, crystal growth, rare earth industry, organic chemistry, and transportation. For individual titles, see N84-10767 through N84-10768.

N84-10767# Joint Publications Research Service, Arlington, Va.
NATIONWIDE COMPUTER USERS' INFORMATION RETRIEVAL SYSTEM
Sun Zhihui, Zhu Yijian, and Tang Yan *In its* China Rept.: Sci. and Technol., No. 208 (JPRS-84474) 5 Oct. 1983 p 3-12 Transl. into ENGLISH from Nanjing Gonxueyuan Xuebao (Nanjing), no. 2, 1983 p 66-71 (For primary document see N84-10766 01-60)
Avail: NTIS HC A04

The design and implementation of a practical Chinese-character information retrieval system is discussed. This system can store 41 pieces of technical data on every computer user and 40 pieces of technical data in all computer models used in the country. It has the capability of performing information retrieval, statistical analysis, data modification and deletion; the results can be displayed or printed in clear Chinese characters. For the user's convenience and to increase the user's confidence in using the system, all operations of the system are displayed on the screen in Chinese characters; also, diagnostic and editing capabilities are provided. M.G.

N84-10768# Joint Publications Research Service, Arlington, Va.
YIDOYU-1: COMPUTER SYSTEM FOR OPTIMAL WING DESIGN
Yeh Kejia, Lin Menghe, and Liang Mengjue *In its* China Rept.: Sci. and Technol., No. 208 (JPRS-84474) 5 Oct. 1983 p 22-30 Transl. into ENGLISH from Guoji Hangkong (Beijing), no. 7, 5 Jul. 1983 p 2-4 (For primary document see N84-10766 01-60)
Avail: NTIS HC A04

The YIDOYU-1 is a FORTRAN application software developed by the Chinese Aeronautical Research Institute to perform optimal design calculations for large, general structures. It can be used to carry out optimal design of airplane wing structures under multiple constraint conditions. Its main features are: (1) it uses nonlinear mathematical programming techniques to treat optimal wing design problems with multiple constraint conditions and it can also accommodate expanded constraint types according to input requirements; (2) it can be used to design wing structures with control surfaces and with attached fuselage sections; (3) practical methods of stability calculations are introduced through allowable stresses for redesign; (4) it has good presolution and postsolution analysis capability; (5) it contains user oriented special language; and (6) it uses analytical methods to compute various response

coefficients and relies on many approximation techniques for the optimization model to increase the efficiency of optimal design.
M.G.

N84-10769*# SRI International Corp., Menlo Park, Calif.
FAULT TOLERANT ARCHITECTURES FOR INTEGRATED AIRCRAFT ELECTRONICS SYSTEMS Final Report
Karl N. Levitt, P. Michael Melliar-Smith, and Richard L. Schwartz Hampton, Va. NASA. Langley Research Center Aug. 1983 57 p refs
(Contract NAS1-17067; SRI Proj. 4616)
(NASA-CR-172226; NAS 1.26:172226) Avail: NTIS HC A04/MF A01 CSCL 09B

Work into possible architectures for future flight control computer systems is described. Ada for Fault-Tolerant Systems, the NETS Network Error-Tolerant System architecture, and voting in asynchronous systems are covered. Author

N84-10770# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
PRINGLE: A PARALLEL PROCESSOR TO EMULATE CHIP (CONFIGURABLE HIGHLY PARALLEL) COMPUTERS Interim Technical Report
J. Timothy Field, Alejandro A. Kapauan, and Lawrence Snyder Jan. 1983 20 p refs
(Contracts N00014-80-K-0816; N00014-81-K-0360; Proj. Blue Chip)
(AD-A129152; CSD-TR-433) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Pringle is a 64 processor parallel computer designed to serve as a laboratory instrument for studying Configurable, Highly Parallel (CHiP) Computers. The Pringle's design objectives, architecture and physical characteristics are presented. A key component of the Pringle is a Switch that permits it to emulate CHiP architectures with a variety of corridors widths. Author (GRA)

N84-10771# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A DISTRIBUTED SIGNAL PROCESSING ARCHITECTURE
A. E. Filip, J. S. Arthur, J. D. Drinan, A. H. Huntoon, and D. E. Kirk 12 May 1983 100 p refs
(Contract F19628-80-C-0002; AF Proj. 2698)
(AD-A130227; TR-637; ESD-TR-82-178) Avail: NTIS HC A05/MF A01 CSCL 09/2

An architecture is described for a multi-processor implementation of real-time signal processing algorithms. A butterfly network is used to provide simultaneous, conflict-free interprocessor communication for multi-dimensional convolution and Fourier transformation. A hardware demonstration test-bed using four active processors was used to validate the concepts of shared algorithm execution, conflict-free data transfers, distributed network control, dynamic fault tolerance, and identical software in all processors. The Distributed Signal Processor (DISP) is designed to perform real-time signal processing on large data sets. Potential applications for the DISP include image processing (enhancement, restoration, segmentations, and coding), radar imaging, synthetic aperture radar, and infrared imaging (passive or active). These applications share three important characteristics. First, the data sets are large, generally multi-dimensional, with high computation rates. Second, the applications make extensive use of convolution and Fourier transformation algorithms. Finally, real-time signal processing applications generally have a regular, well defined time-line. GRA

N84-10772# Stanford Univ., Calif. Center for Reliable Computing.
HARD CPU RELATED FAILURES AND SYSTEM ACTIVITY: MEASUREMENT AND MODELLING Interim Technical Report
Ravishankar K. Iyer and David J. Rossetti May 1983 42 p refs
(Contracts DAAG29-82-K-0105; DE-AC03-76F-00515)
(AD-A130821; ARO-18690.5-EL; CRC-TR-83-6; CSL-TN-225) Avail: NTIS HC A03/MF A01 CSCL 05/1

This paper describes the measurement and analysis of hard CPU and memory errors, and system activity at the Stanford Linear Accelerator Center computational facility. Nearly 25 percent of the errors were estimated to be permanent. The occurrence of a failure was found to be strongly correlated with the level and type of workload prior to the occurrence of the failure. For example, it is shown that the risk of a permanent error increases in a non-linear fashion with the amount of interactive processing. The observed tendency is present in three years of load data. This observation is significant because a load-failure relationship found at the CPU level must, in our view, be considered fundamental. In addition, the fact that most of the errors are permanent, provides new information on these error types viz. their load dependent behavior. Our analysis procedure, used on the SLAC data, has been validated on an artificially created data base seeded with failures.
Author (GRA)

N84-10773# Stanford Linear Accelerator Center, Calif.
FAST MULTICHANNEL ANALOG STORAGE SYSTEM
D. R. Freytag Nov. 1982 3 p refs Presented at the IEEE Nucl. Sci. Symp., Washington, 20-22 Oct. 1982
(Contract DE-AC03-76SF-00515)
(DE83-012711; SLAC-PUB-3010; CONF-821011-50) Avail: NTIS HC A02/MF A01

A multichannel analog storage system based on a commercial 32 channel parallel in/serial out (PISO) analog shift register is described. The basic unit is a single width CAMAC module containing 512 analog cells and the associated logic for data storage and subsequent readout. At sampling rates of up to 30 MHz the signals are strobed directly into the PISO. At higher rates signals are strobed into a fast presampling stage and subsequently transferred in block form into an array of PISO's. Sampling rates of 300 MHz have been achieved with the present device and 100 MHz are possible with improved signal drivers. The system is well suited for simultaneous handling of many signal channels with moderate numbers of samples in each channel. The RMS noise over full scale signal was measured as 1:3000 (approx. = 11 bit). However, nonlinearities in the response and differences in sensitivity of the analog cells require an elaborate calibration system in order to realize 11 bit accuracy for the analog information. DOE

N84-10774# California Univ., Livermore. Lawrence Livermore Lab.
S-1 UNIPROCESSOR ARCHITECTURE
21 Apr. 1983 390 p
(Contract W-7405-eng-48)
(DE83-012344; UCID-19782) Avail: NTIS HC A17/MF A01

The S-1 Mark IIA uniprocessor is the second generation of a pipelined vector and scalar processing computer with a virtual address space of 2(29) thirty-six bit words, addressable in quarterwords, and a physical address space of 2(32) singlewords. Its native mode instruction set and an assembler for that instruction set are described. DOE

N84-10775# Fermi National Accelerator Lab., Batavia, Ill.
MEMORY-MAPPED CAMAC BRANCH DRIVER
M. F. Shea and A. A. Jones Aug. 1983 7 p
(Contract DE-AC02-76CH-03000)
(DE83-016084; FERMILAB/TM-1203) Avail: NTIS HC A02/MF A01

In a distributed microprocessor-based control system, it may be necessary to interface with hardware configured in CAMAC. This note describes an interface between a VMEbus microcomputer and CAMAC. DOE

N84-10776# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DATA GENERAL CORPORATION ECLIPSE MV/8000, AOS/VS BASIC REVISION 2.20 Validation Summary Report
30 Nov. 1982 15 p refs
(PB83-233452; OSD/FSTC-82/274-Rev-2.20) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corporation, AOS/VS BASIC REV. 2.20 running under the AOS/VS 1.61 provides a consolidated summary of the results obtained

from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-10777# Hanford Engineering Development Lab., Richland, Wash.
CONCURRENT PASCAL FOR RSX-11M
Neil B. Corrigan Nov. 1982 48 p refs
(Contract DE-AC06-77FF-02170)
(HEDL-TME-82-46) Avail: NTIS HC A03/MF A01

The Concurrent Pascal programming language allows processes defined within a single program to run concurrently and cooperate on a common task. The principal feature of Concurrent Pascal is the monitor construct, which synchronizes process operations and defines data structures to be shared among concurrently executing processes. A straightforward and reliable implementation of systems designed for operation in a concurrent environment results from the use of concurrent programming, making Concurrent Pascal an ideal language for the development of real time applications. An implementation of Concurrent Pascal for use on Digital Equipment Corporation PDP-11 and LIST-11 computer systems running the RSX-11M operating system is presented, and a complete sample program demonstrating the use of Concurrent Pascal is provided. Author

N84-10778*# Old Dominion Univ., Norfolk, Va. Dept. of Chemical Sciences.
ANALYSIS OF AN EFFUSIVE SAMPLING DEVICE FOR ANALYSIS OF BOUNDARY LAYER GASES Final Report, 1 Dec. 1982 - 30 Sep. 1983
K. G. Brown Oct. 1983 22 p refs
(Contract NAS1-17099)
(NASA-CR-174532; NAS 1.26:174532) Avail: NTIS HC A02/MF A01 CSCL 09B

The effect of suction, through an opening in a surface, upon a stream of flowing gas is determined. The quantity of interest is the maximum distance, Y, from the surface that the main stream is affected by the applied suction. The fraction of this distance Y of the boundary layer thickness sigma is determined as a function of tubing radius and length, gas pressure, temperature and stream velocity. The shape of the flow in the high velocity stream is assumed to be determined by means of a parameter which is an unknown function of the distance from the leading edge of the surface. Author

N84-10779*# Remtech, Inc., Huntsville, Ala.
MINIVER UPGRADE FOR THE AVID SYSTEM. VOLUME 1: LANMIN USER'S MANUAL
Carl D. Engel and Sarat C. Praharaj Aug. 1983 127 p refs 2 Vol.
(Contract NAS1-16983)
(NASA-CR-172212; NAS 1.26:172212) Avail: NTIS HC A07/MF A01 CSCL 09B

The successful design of thermal protection systems for vehicles operating in atmosphere and near space environments requires accurate analyses of heating rate and temperature histories encountered along a trajectory. For preliminary design calculations, however, the requirement for accuracy must be tempered by the need for speed and versatility in computational tools used to determine thermal environments and structural thermal response. The MINIVER program has been found to provide the proper balance between versatility, speed and accuracy for an aerothermal prediction tool. The advancement in computer aided design concepts at Langley Research Center (LaRC) in the past few years has made it desirable to incorporate the MINIVER program into the LaRC Advanced Vehicle Integrated Design, AVID, system. In order to effectively incorporate MINIVER into the AVID system, several changes to MINIVER were made. The thermal conduction options in MINIVER were removed and a new Explicit Interactive Thermal Structures (EXITS) code was developed. Many upgrades to the MINIVER code were made and a new Langley version of MINIVER called LANMIN was created. The theoretical methods and subroutine functions used in LANMIN are described. Author

N84-10780*# Remtech, Inc., Huntsville, Ala.
MINIVER UPGRADE FOR THE AVID SYSTEM. VOLUME 2: LANMIN INPUT GUIDE
Carl D. Engel and Craig P. Schmitz Aug. 1983 169 p 2 Vol.
(Contract NAS1-16983)
(NASA-CR-172213; NAS 1.26:172213) Avail: NTIS HC A08/MF A01 CSCL 09B

In order to effectively incorporate MINIVER into the AVID system, several changes to MINIVER were made. The thermal conduction options in MINIVER were removed and a new Explicit Interactive Thermal Structures (EXITS) code was developed. Many upgrades to the MINIVER code were made and a new Langley version of MINIVER called LANMIN was created. A user input guide for LANMIN is provided. Author

N84-10781# Massachusetts Computer Associates, Inc., Wakefield.
NSW (NATIONAL SOFTWARE WORKS) EXECUTIVE ENHANCEMENTS II Final Technical Report, 7 May 1981 - 30 Sep. 1982
Charles A. Muntz Griffiss AFB, N.Y. RADC Mar. 1983 92 p
(Contract F30602-81-C-0208; AF Proj. 2531)
(AD-A129022; RADC-TR-83-59; CADD-8301-3001) Avail: NTIS HC A05/MF A01 CSCL 09/2

The National Software Works (NSW) represents a significant evolutionary in the fields of distributed processing and network operating systems. Its ambitious goal has been to link the resources of a set of geographically distributed and heterogeneous hosts with an operating system which would appear as a single entity to a user. It is principally aimed at the development of software systems and at providing software tools which can be used to support the software development activity throughout its life cycle. This report describes the current status of the NSW system as well as highlights the enhancements and improvements made to the NSW system during the past two years. Author (GRA)

N84-10782# Dayton Univ., Ohio. Analytical Mechanics Group.
MAGNA (MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS). PART 2: PREPROCESSOR MANUAL Final Report, Mar. 1980 - Dec. 1982
T. S. Bruner, Robert A. Brockman, and K. A. Primrose Wright-Patterson AFB, Ohio AFWAL Dec. 1982 232 p refs Supersedes AFWAL-TR-81-3180
(Contracts F33615-80-C-3403; F33615-76-C-3103; AF Proj. 2402)
(AD-A129025; AFWAL-TR-82-3098-Pt-2; AFWAL-TR-81-3180; UDR-TR-82-112) Avail: NTIS HC A11/MF A01 CSCL 09/2

A preprocessor system developed for use in connection with three dimensional finite element analysis is described. The system consists of several data entry modules, a central preprocessor and various data translation and conversion utilities. Data entry and generation functions include keyboard, digitizer, and file inputs, which are oriented toward the type of thick shell geometry currently encountered in aircraft transparency analysis. The main preprocessor operates on models in superelement form, permitting selective mesh refinement, numerous geometric transformations, and merging of separate models to form the final analysis mesh. Data reformatting modules permit the generation of a complete input file for finite element analysis, and/or the translation of finite element data into other forms for archiving or further processing external to the preprocessor itself. Author (GRA)

N84-10783# Dayton Univ., Ohio. Analytical Mechanics Group.
MAGNA (MATERIALLY AND GEOMETRICALLY NONLINEAR

ANALYSIS). PART 4. QUICK-REFERENCE MANUAL Final Report, Mar. 1980 - Dec. 1982
Robert A. Brockman Wright-Patterson AFB, Ohio AFWAL Dec. 1982 37 p
(Contracts F33615-80-C-3403; F33615-76-C-3103; AF Proj. 2402)
(AD-A129026; AFWAL-TR-82-3098-Pt-4; UDR-TR-82-114) Avail: NTIS HC A03/MF A01 CSCL 09/2

This manual summarizes access and operating procedures for the MAGNA finite element analysis program and related pre- and postprocessing programs. Parallel descriptions are given for CDC, VAX, and CRAY versions of the programs where applicable. The overall organization of the system is also described, including possible data paths and data file types. The manual is intended to provide a broad summary of the MAGNA system, as well as a concise summary of the operating procedures described in other volumes of the program documentation. Author (GRA)

N84-10784# Lockheed-Georgia Co., Marietta.
COMPUTER-AIDED DESIGN AND EVALUATION TECHNIQUES (CADET) Final Report, Oct. 1981 - Dec. 1982
James M. Richards and Michael A. Companion Wright-Patterson AFB, Ohio AFWAL Dec. 1982 52 p refs
(Contract F33615-81-C-3612; AF Proj. 2403)
(AD-A130146; AFWAL-TR-82-3096) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Computer-Aided Design and Evaluation Techniques (CADET) program was initiated to identify and evaluate computer techniques that might be used in the design and evaluation of crew systems. Recommendations for future expansion and development of such techniques by the Flight Dynamics Laboratory (FDL) of the AF Wright Aeronautical Laboratories are included. The original intent was to select those techniques that were compatible to computer hardware currently available at Wright-Patterson Air Force Base. Subsequent information indicated that future computer capacity made this constraint unnecessary. Existing techniques identified as having potential to augment FDL's flight station design methodology include a cad system, COMBIMAN, HOS, PLAID, SAINT, and WAM. GRA

N84-10785# Texas Univ., Austin. Inst. for Computing Science and Computer Applications.
A MECHANICAL PROOF OF THE TURING COMPLETENESS OF PURE LISP
Robert S. Boyer and J. Strother Moore May 1983 39 p refs
(Contract N00014-81-K-0634; Grant NSF MCS-82-02943)
(AD-A130625; ICSCA-CMP-37) Avail: NTIS HC A03/MF A01 CSCL 09/2

The authors describe a proof by a computer program of the Turing completeness of a computational paradigm akin to Pure LISP. That is, they define formally the notions of a Turing machine and of a version of Pure LISP and prove that anything that can be computed by a Turing machine can be computed by LISP. While this result is straightforward, they believe this is the first instance of a machine proving the Turing completeness of another computational paradigm. Author (GRA)

N84-10786# California Univ., Los Angeles. School of Management.
ISSUES IN SOFTWARE MAINTENANCE
Bennet P. Lientz Jul. 1983 24 p refs
(Contract N00014-83-K-0257; NR Proj. 049-345)
(AD-A130622) Avail: NTIS HC A02/MF A01 CSCL 05/1

Up to a few years ago the area of software maintenance was largely ignored. Interest has increased in the last few years due to several factors. First, the increased volume of enhancement and maintenance with more systems from that of ten years ago has restricted resources available for new development. Second, there has been a growing awareness that tools and aids which assist development of information systems may have little effect on operational systems. Third, the management of information systems has come under increasing scrutiny. In this report we highlight some of the major issues that surfaced during several extensive operational software studies. These sources have pointed to significant questions that must be addressed concerning the roles of the users in operations and maintenance, the management of maintenance, and the types of tools and techniques that are needed in maintenance. Author (GRA)

N84-10787# Association for Computational Linguistics.
PROCEEDINGS OF THE CONFERENCE ON APPLIED NATURAL LANGUAGE PROCESSING
1983 211 p Conf. held at Santa Monica, Calif., 1-3 Feb. 1983
(Grant N00014-83-G-0059)
(AD-A129824) Avail: NTIS HC A10/MF A01 CSCL 09/2

This conference focuses on the use of computational linguistic techniques to solve real world problems. Technical papers are presented in sessions on domain-independent natural language interfaces, knowledge-based approaches, handling ill-formed input, text analysis, machine translation, and speech interfaces. A panel considers the impact of natural language access on database design and implementation. There also are demonstrations of working systems; exhibits of special purpose processors, tools, and other materials that support natural language processing; and tutorials covering special topic areas. GRA

N84-10788# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THE NEST CHEMISTRY COMPUTER PROGRAM: OPERATIONS HANDBOOK
Karen L. Foster and Emily B. Turner 5 May 1983 59 p refs
(Contract F04701-82-C-0083)
(AD-A130215; SD-TR-83-27; TR-0083(3930-01)-8) Avail: NTIS HC A04/MF A01 CSCL 09/2

The NEST Chemistry Computer Program is used to calculate fluid and thermodynamic properties of frozen equilibrium, and nonequilibrium chemically reacting one dimensional flows. The operational procedure required for the use of the program is documented including detailed instruction for the preparation of input, a description of the output, and a typical deck setup for the running production on the Aerospace Corporation's CDC 7600 or CYBER 176 computers. Author (GRA)

N84-10789# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.
COMPOSITE LAMINATE WEIGHT OPTIMIZATION ON THE TIMEX-SINCLAIR 1000 MICROCOMPUTER Final Technical Report
Gerald V. Flanagan Feb. 1983 49 p refs
(AF Proj. 2307)
(AD-A130214; AFWAL-TR-83-4017) Avail: NTIS HC A03/MF A01 CSCL 09/2

CLASS (Composite Laminate Automated Sizing for Strength) is an interactive optimization program designed to run on a small microcomputer. The listing presented here is for a Sinclair ZX81 or a Timex-Sinclair 1000 microcomputer with a 16K memory expansion. The version of Basic is standard enough that translations to other microcomputers are possible. The program will find a minimum thickness laminate which will not fail under any of the load conditions entered. Ply orientation are chosen by the user. The program's capability in handling multiple, independent, loads could be useful for loads which change with time or for situations where there is uncertainty in calculating the loads. As the program is currently dimensioned, four independent load combinations and 18-ply orientations can be entered. Only point stresses are considered, thus the program optimizes the laminate only at one point in the structure. Furthermore, the program assumes in-plane loads only and no out-of-plane deflections. This implies a symmetric laminate, but stacking sequence is not a factor in the program. The layer thicknesses generated by the program are the total and must be divided by 2 to get the halves of a symmetric laminate. No knowledge of optimization techniques is needed to run the program and very little knowledge of laminate plate theory is needed. In addition, material properties for five common advanced composites are stored in the program, or the computer can ask for new properties through prompts. GRA

N84-10790# Ohio State Univ., Columbus. Electroscience Lab.
GENERAL 3RD AIRBORNE ANTENNA RADIATION PATTERN CODE USERS MANUAL Interim Report, Apr. 1981 - Jul. 1982
Hsin H. Chung and W. D. Burnside Griffiss AFB, N.Y. RADC Feb. 1983 140 p refs
(Contract F30602-79-C-0068; AF Proj. 4519)
(AD-A130359; ESL-711679-10; RADC-TR-83-39) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report describes a computer program and how it may be used to analyze the performance antennas mounted on aircraft. The computer program may also be used to simulate a wide variety of complex electromagnetic radiation problems using the spheroid/plates model. The computer program is based upon the uniform Geometric Theory of Diffraction and various computed patterns are compared with experimental results in the report. The organization of the computer program code, definition of input and output data, and examples for simulating antenna performance on different airframes are also presented. Author (GRA)

N84-10791# Alabama Univ., Huntsville. School of Engineering.
STINGER POST HYBRID SIMULATION: DESIGN DESCRIPTION AND USERS' MANUAL Technical Report, 21 Jun. - 30 Nov. 1982
Terry N. Long, Timothy A. Palmer, and Donn A. Hall Apr. 1983 160 p refs
(Contract DAAH01-82-D-A008)
(AD-A130027; AD-E950403; UAH-TR-83/1; DRSMI/RD-CR-83-15) Avail: NTIS HC A08/MF A01 CSCL 09/2

Development of a hybrid simulation for the Stinger POST Missile System was completed during this task. A comprehensive users' manual is presented through this report. Descriptions of the analog models, electronics breadboard assembly, control logic, digital program, interfaces, diagnostic capabilities, and operation sequences are provided. Author (GRA)

N84-10792# Stanford Univ., Calif. Dept. of Computer Science.
AUTOMATED STEREO PERCEPTION Ph.D. Thesis
R. David Arnold Mar. 1983 133 p refs
(Contract N00039-82-C-0250)
(AD-A130645; SU-STAN-CS-83-961; AIM-351) Avail: NTIS HC A07/MF A01 CSCL 20/6

This research aims to advance the science of computer stereo vision - reconstruction of 3 dimensional scenes from 2 dimensional images. The problem is to establish a correspondence between features or regions in two or more images from which we can calculate positions in 3-space. In his research, the author chooses to match features, rather than use the traditional methods of area correlation. The features he uses are extended edges, or more precisely, the image curves which are the projections of edges in the scene. Assumed is a preprocessing stage which can extract such edges by first applying an edge operator and then linking edge elements into extended image curves. The choice of feature-based stereo over area-based stereo offers advantages in speed and accuracy, as well as avoiding some fundamental problems. GRA

N84-10793# University of Southern California, Marina del Rey. Information Sciences Inst.
THE GIST BEHAVIOR EXPLAINER
William R. Swartout Jul. 1983 18 p refs Presented at the Natl. Conf. on Artificial Intelligence, Washington, Aug. 1983
(Contract F30602-81-K-0056)
(AD-A130730; ISI/RS-83-3) Avail: NTIS HC A02/MF A01 CSCL 09/2

One difficulty in understanding formal specifications is that there are often interactions between pieces of the specification, never explicitly stated, that only become apparent when the specification is analyzed or simulated. Symbolic evaluation has been proposed as a way of making such interactions apparent, but symbolic evaluators often produce enormous execution traces that are tedious and difficult to examine. This paper presents an automated system that employs a number of heuristics to select the most interesting aspects of the trace for presentation. The system uses this information to construct an English description of the trace. Due to the need for summarization and proof reformulation, the direct-translation approach, which worked well in describing specifications statically, is not suitable in this case. This paper describes the system and gives an example of its output. Author (GRA)

N84-10794# Stanford Univ., Calif. Lab. for Computer Systems.
DIRECTLY EXECUTED LANGUAGES Annual Report, 19 Apr. 1982 - 18 Apr. 1983
Michael J. Flynn Jun. 1983 11 p refs
(Contract DAAG29-82-K-0109)
(AD-A130704; ARO-18553.4-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

This work compared computer architectures by measuring the execution of an identical set of high level language programs. Comparative studies are difficult and expensive as they require an environment in which all the architectures can be analyzed on a common basis. Simulation has been used, but the slow speed makes it prohibitively long to collect a significant sample. Performance measures, such as the number of instructions, reflect not only architectural differences but factors (such as compilers) not related to the architecture. Author (GRA)

N84-10795# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
DYNAMIC PROGRAMMING ALGORITHMS AND ANALYSES FOR NONSERIAL NETWORKS, PART 1 Final Report, 25 Sep. 1980 - 24 Sep. 1983
Augustine O. Esogbue Jan. 1983 109 p refs
(Grant DAAG29-80-G-0010)
(AD-A130885; ARO-17672.1-MA-H-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 12/2

This report discusses the research conducted by the research team at the Georgia Institute of Technology in the area of nonserial dynamic programming networks. The problems, approach and major results are summarized in Chapter 1, while the rest of the chapters discuss, in detail, the algorithm developments, experiment with sample problems, and algorithmic complexities. Each chapter contains detailed computer flow charts for the algorithms developed. Chapter 6 employs an efficient dimensionality reduction algorithms known as the imbedded state space method in conjunction with the one developed in this study to treat an otherwise intractable problem involving feedforward loop systems. These algorithms are useful inputs to the development of dynamic programming based strategies for the analysis of complex nonserial networks. GRA

N84-10796# City Univ. of New York, N. Y. Dept. of Computer Science.
ALGORITHMS FOR NONLINEAR PROGRAMMING Final Report, 1 Aug. 1982 - 1 Jun. 1983
Donald Goldfarb Jul. 1983 6 p refs
(Contract DAAG29-82-K-0163)
(AD-A130903; ARO-19274.3-MA; REPT-83-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several algorithms in linear, quadratic, and nonlinear programming have been developed and analyzed. These include: (1) The development of relaxation methods for finding a feasible solution to a system of linear inequalities based upon generating surrogate constraints; (2) The worst-case behavior of the shadow-vertex simplex algorithm was shown to be the exponential; (3) Necessary and sufficient conditions for versions of iterative methods, including the Jacobi, Gauss-Seidel and SOR methods, designed for solving equality constrained quadratic programs have been obtained; (4) The development of numerically stable and efficient implementations of primal methods for quadratic programming; and (5) the development of optimal algorithms for estimating Jacobian and Hessian matrices arising in finite difference calculations. Author (GRA)

N84-10797# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.

COMPUTER CENTER INTRODUCTORY REFERENCE MANUAL FOR CDC 6000 Final Report
David V. Sommer May 1983 32 p
(AD-A130941; DTNSRDC/CMLD-83-13) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Computer Center Introductory Reference Manual provides an introduction to the CDC 6000 NOS/BE Operating System for new users. Some information has been distilled from many individual documents and reflects usage at DTNSRDC. Control card examples and descriptions of some software are included.
Author (GRA)

N84-10798# Atlanta Univ., Ga. Dept. of Mathematical Sciences.
DYNAMIC PROGRAMMING ALGORITHM AND ANALYSES FOR NONSERIAL NETWORKS, PART 2 Final Report, 25 Sep. 1980 - 24 Sep. 1983
Nazir A. Warsi Jan. 1983 44 p
(Contract DAAG29-80-G-0010)
(AD-A130905; ARO-17672.2-MA-H) Avail: NTIS HC A03/MF A01 CSCL 12/1

The design of algorithm plays an important role in operations research in general and dynamic programming in particular. In most dynamic programming algorithms, formalism of computing, data structure and complexity analysis does not appear. One of the objectives of this research is to provide such a formalism. Converging branch, diverging branch, feed-forward loop and feedback loop systems are considered. In each case, first, a high level algorithm followed by the detailed computer algorithm is described. Formulas for storage and computational complexities for each computer algorithm are derived. Finally algorithms are implemented on VAX-11/780 computers using UCSD PASCAL.
Author (GRA)

N84-10799# Texas Univ., Austin. Inst. for Computing Science and Computer Applications.
PROOF-CHECKING, THEOREM PROVING AND PROGRAM VERIFICATION
Robert S. Boyer and J. Strother Moore Jan. 1983 23 p refs
(Contract N00014-81-K-0634; Grant NSF MCS-82-02943; NR Proj. 049-500)
(AD-A130638; ICSCA-CMP-35) Avail: NTIS HC A02/MF A01 CSCL 12/1

This article consists of three parts: a tutorial introduction to a computer program that proves theorems by induction; a brief description of recent applications of that theorem-prover; and a discussion of several nontechnical aspects of the problem of building automatic theorem-provers. The theorem-prover described has proved such theorems as the uniqueness of prime factorizations, Fermat's theorem, and the recursive unsolvability of the halting problem. The article is aimed at those who know nothing about automatic theorem-proving but would like a glimpse of one such system. The authors' opinion, the limiting factor in progress in automatic theorem-proving, is the quality of the mathematicians who are attempting to build such systems. They encourage good mathematicians to work in the field. GRA

N84-10800# Honeywell Systems and Research Center, Minneapolis, Minn.
REFERENCE MANUAL FOR THE ADA PROGRAMMING LANGUAGE
Jan. 1983 334 p Prepared in cooperation with Alsys, Saint Cloud, France
(Contract MDA903-77-C-0331)
(AD-A131511) Avail: NTIS HC A15/MF A01 CSCL 09/2

Ada is a programming language designed in accordance with requirements defined by the United States Department of Defense: the so-called Steelman requirements. Overall, these requirements call for a language with considerable expressive power covering a wide application domain. As a result, the language includes facilities offered by classical languages such as Pascal as well as facilities often found only in specialized languages. Thus the language is a modern algorithmic language with the usual control structures, and with the ability to define types and subprograms. It also serves the need for modularity, whereby data, types, and subprograms can be packaged. It treats modularity in the physical sense as well, with a facility to support separate compilation. In addition to these aspects, the language covers real-time programming, with facilities to model parallel tasks and to handle exceptions. It also covers systems programming; this requires precise control over the representation of data and access to system-dependent properties. Finally, both application-level and machine-level input-ootput are defined. GRA

N84-10801# Stanford Univ., Calif. Dept. of Computer Science.
VERIFICATION OF CONCURRENT PROGRAMS: A TEMPORAL PROOF SYSTEM
Zohar Manna and Amir Pneuli (Weizmann Inst. of Science) Jun. 1983 93 p refs Presented at the 4th School of Advanced Programming, Amsterdam, Jun. 1982
(Contract N00039-82-C-0250; Grants AF-AFOSR-0014-81; NSF MCS-79-09495; NSF MCS-80-06930)
(AD-A131501; SU-STAN-CS-83-967) Avail: NTIS HC A05/MF A01 CSCL 09/2

A proof system based on temporal logic is presented for proving properties of concurrent programs based on the shared-variables computation model. The system consists of three parts: the general uninterpreted part, the domain dependent part and the program dependent part. In the general part we give a complete proof system for first-order temporal logic with detailed proofs of useful theorems. This logic enables reasoning about general time sequences. The domain dependent part characterizes the special properties of the domain over which the program operates. The program dependent part introduces axioms which restrict the time sequences considered to be execution sequences of a given program. The utility of the full system is demonstrated by proving invariance, liveness and precedence properties of several concurrent programs. Derived proof principles for these classes of properties, are obtained and lead to a compact representation of proofs. GRA

N84-10802# Louisiana State Univ., Baton Rouge. Lab. for Remote Sensing and Image Processing.
A STUDY OF TEXTURE ANALYSIS ALGORITHMS Final Technical Report, 1 Mar. 1979 - 31 Aug. 1982
Charles A. Harlow and Richard W. Conners Feb. 1983 76 p refs
(Grant AF-AFOSR-0112-81; AF Proj. 2304)
(AD-A131498; AFOSR-83-0626TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This is the final report for the Air Force Office of Scientific Research grant entitled 'A Study of Texture Analysis Algorithms'. As such this report attempts to provide an overview of the research that was performed and to provide a chronology of the events which precipitated the various studies conducted. The research described ranges from developing a theoretical comparison method for evaluating the innate abilities of texture analysis algorithms to a formal mathematical method for defining texture measures. The desire was to develop improved texture analysis methods through a systematic theoretical development process. The goal was to create a texture analysis algorithm which could match a level of human perception. The studies described include a comparison of some texture analysis algorithms, the development of a structural texture analyzer based on statistical methods, the examination of texture pairs which are counter examples to the Julesz conjecture, the development of an image segmentation method based on texture analysis methods, the development of a target recognition strategy based on texture methods, and finally a formal mathematical procedure for defining texture measures. Author (GRA)

N84-10803# Carnegie Inst. of Tech., Pittsburgh, Pa. Dept. of Computer Science.
FLEXIBLE PARSING Final Technical Report, 1 Jul. 1981 - 30 Jun. 1982
Philip J. Hayes 22 Oct. 1982 16 p refs
(Contract F49620-79-C-0143; AF Proj. 2304)

(AD-A131495; AFOSR-83-0667TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

When people use language spontaneously, they often do not adhere strictly to commonly accepted standards of grammaticality. The primary objective of this project is to develop flexible computer parsing techniques which can deal with the various kinds of ungrammaticalities that arise, both on the lexical and the phrase level. Author (GRA)

N84-10804# Boeing Aerospace Co., Seattle, Wash.
AFWL BENCHMARK COMPUTER PROGRAM Final Report, 3 Mar. 1980 - 1 May 1982
B. J. Henderson 1 May 1983 96 p refs
(Contract DNA001-80-C-0056)
(AD-A131273; DNA-5852F) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report includes the description of a computer program that partially translates IBM, CDC, DEC and VAX FORTRAN into the subset language of ANSI FORTRAN 77. This contract supports a DNA task to provide fair benchmark computer programs to vendors who bid on a DNA computer procurement project. Author (GRA)

N84-10805# Los Alamos Scientific Lab., N. Mex.
INTERACTIVE MODELING OF SCINTILLATION PULSES BY VISUAL OVERLAY OF COMPUTED PULSE SHAPES WITH THE RAW DATA
J. M. Fluornoy, S. S. Lutz, L. A. Franks, C. B. Ashford, and P. B. Lyons 1983 11 p refs Presented at Advan. in Scintillator Counting Conf., Banff, Alberta, 15-18 May 1983 Prepared in cooperation with Edgerton, Germeshausben and Grier, Inc.
(Contract W-7405-eng-36)
(DE83-012668; LA-UR-83-1391; CONF-830565-1) Avail: NTIS HC A02/MF A01

This interactive visual-overlay modeling technique has proven to be very useful in the analysis of scintillator response data. It has revealed cases in which the scintillation process is more complicated than might have been inferred from routine inspection of the ordinary pulse parameters. This method is especially valuable in providing basic information about energy transfer steps in a multi-component scintillator, in order to tailor scintillator systems to specific applications. DOE

N84-10806# Pacific Northwest Lab., Richland, Wash.
USING THE GLYPH CONCEPT TO CREATE USER-DEFINABLE DISPLAY FORMATS
R. J. Littlefield Jun. 1983 11 p refs Presented at the Natl. Computer Graphics Assoc. Ann. Conf., Chicago, 26-30 Jun. 1983
(Contract DE-AC06-76RL-01830)
(DE83-013831; PNL-SA-11317; CONF-830620-2) Avail: NTIS HC A02/MF A01

Although many numerical display formats are known, software is usually available for only a few of the most common. This paper discusses how the concept of a generalized plotting symbol, or glyph, can be used to address this problem. Many display formats can be described conveniently using glyphs, and a plotting package that supports glyphs can be tailored cheaply and easily to produce a wide variety of displays. The glyph concept is also useful in understanding data displays and adapting them for new uses. Several techniques for implementing and applying glyphs are illustrated. DOE

N84-10807# Los Alamos Scientific Lab., N. Mex.
FUTURE DIRECTIONS IN LARGE-SCALE SCIENTIFIC COMPUTING
J. M. Hyman Apr. 1983 32 p refs
(Contract W-7405-eng-36)
(DE83-013229; LA-9637-MS) Avail: NTIS HC A03/MF A01

Techniques now used to program physics production codes cannot cope with the increasing complexity of large-scale scientific and engineering problems. Future codes must be based on sound, scientific, computing-structured design principles and include the characteristics of flexibility, modularity, reliability, have standardized documentation, and use high-level support libraries. To meet these requirements, high-level mathematical software must be developed and existing ties among the national laboratories, industry, and universities must be strengthened. DOE

N84-10808# Stanford Univ., Calif. Systems Optimization Lab.
DOCUMENTATION FOR FDCALC AND FDCORE
Philip E. Gill, Walter Murray, Michael A. Saunders, and Margaret H. Wright Jun. 1983 25 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; DAAG29-81-K-156; Grants NSF MCS-79-26009; NSF ECS-80-12974)
(DE83-013886; AD-A130760; SOL-83-6) Avail: NTIS HC A02/MF A01

This report documents two FORTRAN subroutines, FDCALC and FICORE, that compute a set of forward-difference intervals to be used in minimizing a smooth function. The primary subroutine FDCORE, which is called repeatedly by FDCALC, produces a suitable interval for a univariate function, as well as approximations to the first and second derivatives. DOE

N84-10809# Argonne National Lab., Ill.
FORTRAN 8X: A CONTINUING LANGUAGE FOR NUMERICAL SOFTWARE
Brian T. Smith 1983 8 p refs Presented at the Intern. Conf. on Tools, Methods, and Languages for Sci. and Eng. Computation, Paris, 17 May 1983
(Contract W-31-109-eng-38)
(DE83-014290; CONF-830531-3) Avail: NTIS HC A02/MF A01

For scientific software, FORTRAN is the language of choice. Numerical software is used by scientists and engineers to solve computational problems. Thus FORTRAN is the obvious choice for writing numerical software. The question is: will FORTRAN continue to be the language of choice for scientific computation. If the answer is yes, then FORTRAN remains the obvious choice for writing numerical software. This paper reviews the niche in the spectrum of programming languages that FORTRAN has made for itself and includes a brief review of the major facilities for the next FORTRAN. DOE

N84-10810# California Univ., Livermore. Lawrence Livermore Lab.
CAMDAS (CAMAC DATA-ACQUISITION SYSTEM)
Robert E. Howe 20 May 1983 40 p
(Contract W-7405-eng-48)
(DE83-014907; UCID-19806) Avail: NTIS HC A03/MF A01

A CAMAC based data acquisition system for the Lawrence Livermore Physics department is described. The system combines the versatility of CAMAC together with the speed of a PDP-11/23 processor and the convenience of FORTRAN programming language. The software permits acquisition in several different modes simultaneously. Acquisition modes include multiscaling, multichannel analysis (PHA), and event by event. Step by step instructions are supplied for configuring the hardware, booting up the system, understanding the command structure, recovering from errors, and modifying the software. The software is designed not as a sealed system but rather as an operable program which can be enhanced or modified easily by the user. DOE

N84-10811# Stanford Univ., Calif. Department of Operations Research.
COMPUTATIONAL EXPERIENCE IN SOLVING EQUILIBRIUM MODELS BY A SEQUENCY OF LINEAR COMPLEMENTARITY PROBLEMS
Lars Mathiesen Feb. 1983 36 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267)
(DE83-011189; DOE/ER-72018/T9; TR-SOL-83-1) Avail: NTIS HC A03/MF A01

This paper presents a modelling format for partial and general economic equilibrium problems. It reports on computational experience from a series of small to medium sized problems taken from the literature on computation of economic equilibria. The

common characteristic of these models is the presence of weak inequalities and complementary slackness, e.g., a linear technology with alternative activities or various institutional constraints on prices. The equilibrium is computed by solving a sequence of linear complementarity problems (LCP). The iterative (outer) part of this algorithms is a Newton process, while for the inner part we use Lemke's almost complementary pivoting algorithm. Theoretical results for the performance of this algorithm are at present not complete. The computational experience, however, is encouraging. First, the algorithms has solved nine test problems when initiated at reasonable starting points. Five problems are solved for different starting points. This indicates a large region over which the algorithm converges. Next, it is shown that the process is economical in terms of the number of pivots, function evaluations and computer time. DOE

N84-10812# Sandia Labs., Albuquerque, N. Mex.
CAD/CAM: INFLUENCING THE SKILLED TRADES
P. W. Plomp 1983 8 p refs Presented at the 14th Ann. Conf. of Vocational, Tech. and Adult Educators, Albuquerque, N. Mex., 3-5 Aug. 1983
(Contract DE-AC04-76DF-00789)
(DE83-015188; SAND-83-1604C; CONF-830892-1) Avail: NTIS HC A02/MF A01

CAD/CAM is influencing many of the skilled trades. Computers are permitting an increase in productivity with a resulting need for people with greater mental rather then motor skills. Computers are used for the control of a wide variety of manufacturing operations and the trend is accelerating rapidly. The net result is a smaller need for semi-skilled jobs but an increasing demand for skilled craftsmen. DOE

N84-10813# National Bureau of Standards, Washington, D.C. National Measurement Lab.
UTILITY PROGRAMS FOR GENERATING THE HERSHEY CHARACTER FONTS ON MICROCOMPUTERS AND LABORATORY PLOTTERS Final Report
C. E. Dick and J. Hilsenrath Jun. 1983 48 p refs
(PB83-220467; NBS-TN-1176) Avail: NTIS HC A03/MF A01 CSCL 09B

Two programs are described that allow for the storage and manipulation of digitized fonts of graphic arts symbols and characters on the Apple II computer system. These fonts are based on the work of A.V. Hershey and provide the user with a repertory of digitized characters suitable for use in the preparation of camera ready illustration in the laboratory environment. The programs described contain routines for reading files of the Hershey coordinates, storing them as text files, displaying them as individual characters or combined text on the high resolution display, and two methods for editing them or creating special symbols and graphics. Author (GRA)

N84-10814# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE TRW DATACOM AWS 246, TRW COBOL, VERSION 8.0 (PRE-RELEASE)
21 Jan. 1983 19 p refs
(PB83-228148; OSD/FSTC-82/346) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the TRW Datacom, TRW COBOL Version 8.0 (Pre-Release) running under the CTOS Version 7.1 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the indexed I-O, Level 1 and 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found -if any. C companion report Validation Summary Report OSD/FSTC-82/345 provides information regarding the validation of the compiler as the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N84-10815# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE NCR CORPORATION, WS 210, NCR COBOL RELEASE 3.0 (PRE-RELEASE)
21 Jan. 1983 19 p refs
(PB83-228171; OSD/FSTC-82/341) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the NCR Corporation, NCR COBOL Release 3.0(Pre-Release) running under the CTOS Release 7.1 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O, Levels 1 and 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found -if any. A companion report Validation Summary Report (OSD/FSTC-82/340 provides information regarding the validation of the compiler as the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N84-10816# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION B21-6T (512K), B20 COBOL RELEASE 3.0 (PRE-RELEASE)
21 Jan. 1983 19 p refs
(PB83-228130; OSD/FSTC-82/331) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the Burroughs Corporation, B20 COBOL Release 3.0 (Pre-Release) running under the BTOS Release 2.4 provides a consolidated summary of the result obtained from the evaluation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing report all the discrepancies found -if any. A companion report Validation Summary Report Indexed I-O, Levels 1 and 2 OSD/FSTC-82/330 provides information regarding the validation of the compiler as the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N84-10817# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONVERGENT TECHNOLOGIES IWS 111, CT COBOL VERSION 8.0 (PRE-RELEASE)
21 Jan. 1983 19 p refs
(PB83-228122; OSD/FSTC-82/326) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the Convergent Technologies, CT COBOL Version 8.0 (Pre-Release) running under the CTOS Version 7.1 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O, Level 1 and 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found -if any. A companion report Validation Summary Report OSD/FSTC-82/325 provides information regarding the validation of the compiler as the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21/1). GRA

N84-10818# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONVERGENT TECHNOLOGIES AWS 267, CT BASIC VERSION 8.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 27 p refs
(PB83-227306; OSD/FSTC-82/328) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Convergent Technologies, CT BASIC Compiler Version 8.0 (Pre-Release) running under the CTOS Version 7.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found -if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10819# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION B21-6T (512K), B20 BASIC RELEASE 3.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 27 p refs
(PB83-227298; ODS/FSTC-82/333) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation, B20 BASIC Compiler Release 3.0 (Pre-Release) running under the BTOS Release 3.0 (Pre-Release) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found -if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10820# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONVERGENT TECHNOLOGIES, IWS 111, CT FORTRAN VERSION 8.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 26 p refs
(PB83-227280; OSD/FSTC-82/327) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Convergent Technologies, CT FORTRAN, Version 8.0 (Pre-Release) running under the CTOS Version 8.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10821# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE TRW DATACOM, AWS 267, TRW BASIC VERSION 8.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 27 p refs
(PB83-227272; OSD/FSTC-82-348) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the TRW Datacom, TRW BASIC Compiler Version 8.0 (Pre-Release) running under the CTOS Version 7.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10822# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE TRW DATACOM, AWS 246, TRW FORTRAN VERSION 8.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 26 p
(PB83-227264; OSD/FSTC-82-347) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the TRW Datacom, TRW FORTRAN Version 8.0 (Pre-Release) running under the CTOS Version 8.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10823# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE NCR CORPORATION, OFFICE SYSTEMS DIVISION, WS 210, NCR FORTRAN RELEASE 3.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 26 p refs
(PB83-227256; OSD/FSTC-82/342) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NCR FORTRAN Release 3.0 (Pre-Release) running under the CTOS Release 8.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies together with the tests which failed. GRA

N84-10824# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
THE NRC CORPORATION, OFFICE SYSTEMS DIVISION, WS 150 16Mb, NRC BASIC RELEASE 3.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 27 p refs
(PB83-227249; OSD/FSTC-82/343) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NCR Corporation, Office Systems Division, NCR BASIC Compiler Release 3.0 (Pre-Release) running under the CTOS Release 7.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10825# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION, B21-6T (512K), B20 FORTRAN RELEASE 2.0 (PRE-RELEASE) Validation Summary Report
1 Mar. 1983 26 p refs
(PB83-227231; OSD/FSTC-82/332) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation, B20 FORTRAN Release 3.0 (Pre-Release) running under the BTOS Release 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10826# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DATA GENERAL CORPORATION ECLIPSE C/350, AOS FOPTRAN 77, REVISION 2.11 Validation Summary Report
17 Mar. 1983 19 p refs
(PB83-233460; OSD/FSTC-82/273-Rev-2.11) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corporation, AOS FORTRAN 77 Revision 2.11 running under the AOS Revision 4.20 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler

was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10827# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION B21-6T (512K), B20 COBOL RELEASE 3.0 (PRE-RELEASE) Validation Summary Report
21 Jan. 1983 77 p refs
(PB83-233254; OSD/FSTC-82/330) Avail: NTIS HC A05/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Burroughs Corporation B20 COBOL Release 3.0 (Pre-Release) running under the BTOS COBOL Release 3.0 (Pre-Release) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10828# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CONVERGENT TECHNOLOGIES, IWS 111, CT COBOL VERSION 8.0 (PRE-RELEASE) Validation Summary Report
21 Jan. 1983 76 p refs
(PB83-233247; OSD/FSTC-82/325) Avail: NTIS HC A05/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Convergent Technologies, CT COBOL Version 8.0 (Pre-Release) running under the CTOS Version 7.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10829# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
DATA GENERAL CORPORATION ECLIPSE C/350, MP/BASIC REVISION 2.00 Validation Summary Report
7 Feb. 1983 16 p refs
(PB83-233478; OSD/FSTC-82/275-Rev-2.00) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corporation, MP/BASIC Revision 2.00 running under the AOS Revision 4.20 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-10830# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Ocean Technology and Engineering Services.
USER REQUIREMENTS AND A HIGH LEVEL DESIGN OF THE HYDROGRAPHIC SOFTWARE/DATA PROCESSING SUBSYSTEM OF AN AIRBORNE LASER HYDROGRAPHY SYSTEM
Jeffrey D. Childs and David B. Enabnit Dec. 1982 200 p refs
(PB83-228569; NOAA-TR-OTES-11; NOAA-83070501) Avail: NTIS HC A09/MF A01 CSCL 08J

The requirements for the Hydrographic Software/Data Processing Subsystem of an Airborne Laser Hydrography System were documented. A timing analysis of the automated processing determined that a 10 million-instruction-per-second computer would be needed to satisfy the requirements and meet the other constraints. A timing analysis of the required interactive data processing determined that 50-60 man hours of interactive processing would be needed for each hour of data collection. A high-level software design was produced from which the expected number of lines of code was estimated to be 20,000. A conceptual hardware configuration and a development plan were produced. Using the results of the timing and hardware analyses, changes in the requirements and constraints were recommended which make the HS/DP Subsystem feasible while preserving its technical performance. Author (GRA)

62 COMPUTER SYSTEMS

Includes computer networks.

N84-10831*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A METHODOLOGY FOR EXPLOITING PARALLELISM IN THE FINITE ELEMENT PROCESS Final Report
Loyce Adams and Robert G. Voigt Sep. 1983 38 p refs
(Contracts NAS-17070; NAS1-17130)
(NASA-CR-172219; NASA-ICASE-83-33; NAS 1.26:172219) Avail: NTIS HC A03/MF A01 CSCL 09B

A methodology is described for developing a parallel system using a top down approach taking into account the requirements of the user. Substructuring, a popular technique in structural analysis, is used to illustrate this approach. M.G.

N84-10832# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
LOCAL NETWORKING WITH INTELLIGENT NODES
J. Meng Jun. 1983 6 p Presented at the ISMM Intern. Symp. on Mini and Microcomputers and their Appl., San Francisco, 16-17 May 1983 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE83-014900; LBL-16042; CONF-8305105-1) Avail: NTIS HC A02/MF A01

In order to lengthen the useful life of existing office-oriented data processing equipment, and ultimately to ease transitions to newer devices, it is desirable to install the capability of connecting the existing equipment to a resource base which, among other things, permits easy movement of data files from older system onto newer ones and which provides an archiving capability independent of any of the user systems. To achieve this economically, we propose a low-grade RS232-based communications network based on a common intelligent node. Node designs, network interconnections and predicted performance are discussed. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-10833 California Univ., Los Angeles.
OPTIMAL CONTROL OF ROBOTIC MANIPULATORS Ph.D. Thesis
James Edwin Bobrow 1982 116 p
Avail: Univ. Microfilms Order No. DA8306017

The minimum-time control problem is solved for a manipulator

which must move on a specified path subject to actuator torque limitations. The optimal open-loop torques required to move the manipulator on the path are found. The algorithm allows bounds on the torques which may be arbitrary functions of the angles and angular velocities. The algorithm can be used for any manipulator that has rigid links, when its dynamic equations of motion are known, and when all the joint angles can be determined at a given position on the path. A reduction of 50% in the time required for typical manipulator movements is expected over current conventional path plans. A method is also given for determining the angular commands to a conventional linear feedback control system that will cause the optimal torques to be applied to the arm. In order to permit the use of optimal control techniques where the exact dynamic properties are not known precisely (for example unknown payloads), a technique is presented for on-line identification of unknown coefficients in the system equations. Finally, control of manipulators with flexible links is also discussed. Dissert. Abstr.

N84-10834*# National Aeronautics and Space Administration, Washington, D. C.
AN OVERVIEW OF ARTIFICIAL INTELLIGENCE AND ROBOTICS. VOLUME 1: ARTIFICIAL INTELLIGENCE. PART B: APPLICATIONS
William B. Gevarter Oct. 1983 120 p refs
(NASA-TM-85838; NAS 1.15:85838) Avail: NTIS HC A06/MF A01 CSCL 09B

Artificial Intelligence (AI) is an emerging technology that has recently attracted considerable attention. Many applications are now under development. This report, Part B of a three part report on AI, presents overviews of the key application areas: Expert Systems, Computer Vision, Natural Language Processing, Speech Interfaces, and Problem Solving and Planning. The basic approaches to such systems, the state-of-the-art, existing systems and future trends and expectations are covered. Author

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-10835 Michigan Univ., Ann Arbor.
OPTIMIZATION OF FINITE ELEMENT GRIDS USING INTERPOLATION ERROR Ph.D. Thesis
Alejandro Rafael DiazBermudez 1982 154 p
Avail: Univ. Microfilms Order No. DA8304480

The quality of finite element solutions is improved by optimizing the location of the nodes within a fixed number of degrees of freedom. The objective is the reduction of a measure of the difference between the exact and the finite element solutions. Different norms in Sobolev spaces are used to define this measure. The grid optimization problem is treated within the formulation of an optimal design problem. The design variables are the element sizes: length in R1, area in R2. The objective function is constructed from bounds on the error associated with the interpolation of the exact solution. The interpolator is chosen from the finite element space and a relation between interpolation and finite element errors is thereby established. Constraints are introduced to keep the geometry of the domain intact. Optimality conditions for the minimization problem are derived analytically. An approximation to these conditions is introduced to obtain a set of operationally useful equations that can be used in the construction of improved grids. In the one dimensional problem, the approximation to the optimality conditions is derived in an asymptotic manner as the representative size of the mesh approaches zero. The approximation in two dimensions is a natural extension of this result. Dissert. Abstr.

N84-10836*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HIGH RESOLUTION SCHEMES AND THE ENTROPY CONDITION Final Report
Stanley Osher and Sukumar Chakravarthy Sep. 1983 64 p refs (Contract NAS1-17070; Grants NAG1-269; NAG1-270; NAS MCS-82-00788; DAAG29-82-K-0090)
(NASA-CR-172218; ICASE-83-49; NAS 1.26:172218) Avail: NTIS HC A04/MF A01 CSCL 12A

A systematic procedure for constructing semidiscrete, second order accurate, variation diminishing, five point band width, approximations to scalar conservation laws, is presented. These schemes are constructed to also satisfy a single discrete entropy inequality. Thus, in the convex flux case, convergence is proven to be the unique physically correct solution. For hyperbolic systems of conservation laws, this construction is used formally to extend the first author's first order accurate scheme, and show (under some minor technical hypotheses) that limit solutions satisfy an entropy inequality. Results concerning discrete shocks, a maximum principle, and maximal order of accuracy are obtained. Numerical applications are also presented. B.W.

N84-10837*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS Final Report
David Gottlieb (Tel-Aviv Univ.) and Eli Turkel (Tel-Aviv Univ.) Oct. 1983 51 p refs
(Contracts NAS1-16394; NAS1-17130; DAJA38-80-C-0032; Grants AF-AFOSR-3405-77; AF-AFOSR-0089-83)
(NASA-CR-172241; NAS 1.26:172241; Rept-83-54) Avail: NTIS HC A04/MF A01 CSCL 12A

The theory of spectral methods for time dependent partial differential equations is reviewed. When the domain is periodic Fourier methods are presented while for nonperiodic problems both Chebyshev and Legendre methods are discussed. The theory is presented for both hyperbolic and parabolic systems using both Galerkin and collocation procedures. While most of the review considers problems with constant coefficients the extension to nonlinear problems is also discussed. Some results for problems with shocks are presented. Author

N84-10838# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
COMMENTS ON BING'S PAPER ON A POSTERIORI PROBABILITY, AND REPLY TO PROFESSOR L. LORENZ
L. Lorenz and F. Bing 1982 14 p Transl. into ENGLISH from Tidsskrift for Math. (Denmark), ser. 4, v. 3, 1879 p 57-66 and 66-70
(CSIR-Trans-1658) Avail: NTIS HC A02/MF A01

A priori and a posteriori probabilities are discussed. Author

N84-10839# Wisconsin Univ., Madison. Mathematics Research Center.
SMOOTH SOLUTIONS TO A QUASI-LINEAR SYSTEM OF DIFFUSION EQUATIONS FOR A CERTAIN POPULATION MODEL
Jong Uhn Kim Apr. 1983 38 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A129180; MRC-TSR-2510) Avail: NTIS HC A03/MF A01 CSCL 12/1

The system of diffusion equations proposed by Kawasaki, Shigesada and Teramoto describes a population model of two competing species with self- and cross-population pressures. The densities of the two species are denoted by u and v. In this paper the author studies the initial-boundary value problem associated with (*). The Neumann boundary condition (***) corresponds to the case where the flux is zero at the boundary. Many investigators have considered nonlinear diffusion systems arising from various physical and biological problems. These equations, however, have a special structure: the highest order derivatives are not coupled or, at least, the coefficient matrix for the highest order derivatives is positive definite. This is not the case for the system (*) and hence, some of the techniques which are effective for the system are no longer applicable to our case. Nevertheless, we can still use Sobolevski's method (see Reference

2) to establish the local existence of solutions. Under the special assumption c1 = c2 in (*), we can also prove the global existence of solutions by energy estimates. The unusual structure of (*) seems to make it difficult to settle the question of asymptotic stability of solutions. GRA

N84-10840# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON THE GEOMETRY OF KULLBACK-LEIBLER INFORMATION NUMBERS
Wei-Yin Loh Apr. 1983 16 p refs
(Contract DAAG29-80-C-0041; Grants NSF MCS-79-27062; NSF MCS-78-25301; NSF MCS-79-03716)
(AD-A129170; MRC-TSR-2506) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Kullback-Leibler information number is a well-known measure of statistical distance between probability distributions. Previous authors have shown that when endowed with this distance measure, the space of probability distributions possesses geometrical properties analogous to Euclidean geometry. This paper proves a new geometrical property by showing that one can in fact define the shortest line between two probability distributions as well as its mid-point. It turns out that the probability distributions comprising this line have long ago been used as a tool in the important problem of testing statistical hypotheses involving nuisance parameters. Apart from pure mathematical convenience, there has been little justification for its use. The results in this paper are the first attempt at such explanation. GRA

N84-10841# Wisconsin Univ., Madison. Dept. of Mathematics.
BLOCK ITERATIVE METHODS FOR ELLIPTIC FINITE ELEMENT EQUATIONS
Seymour V. Parter and Michael Steuerwalt (LASL) Mar. 1983 78 p refs
(Contract W-7405-eng-36; Grant AF-AFOSR-0275-82; AF Proj. 2304)
(AD-A129150; AFOSR-83-0477TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

Direct iterative methods for solving the linear system AU = Y split A into a difference M-N. By viewing N as a weak multiplication operator, the authors determine the convergence rates of block direct iterative methods for solving the system of equations that arises in the finite element approximation of an elliptic boundary value problem. They illustrate the theory with an analysis of second order Dirichlet problems in the unit square, using Hermite cubic finite element spaces. However, the method of analysis extends to general elliptic boundary value problems of order 2m on bounded domains in d space dimensions, and to a broad class of finite element spaces. GRA

N84-10842# Brown Univ., Providence, R. I.
AN EXAMPLE OF BOUNDARY LAYER IN DELAY EQUATIONS
Kenneth B. Hannsgen, Terry L. Herdman, Harlan W. Stech, and Robert L. Wheeler 1983 8 p refs
(Grant AF-AFOSR-0490-83; AF Proj. 2304)
(AD-A129144; AFOSR-83-0490TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A result for a special equation concerning necessary and sufficient conditions for the existence of an invariant subspace of finite codimension is given. N. W.

N84-10843# Rutgers - The State Univ., Piscataway, N. J.
A NUMERICAL METHOD IN SOLVING A COUPLED THERMO-ELASTICITY EQUATION AND SOME RESULTS Final Report
Y. Y. Li, H. Groneim, Y. Chen, and J. Davis 10 Jun. 1983 30 p refs
(Contract DAAK10-81-C-0040)
(AD-A130183) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report discusses a numerical method in solving a coupled dynamical thermoelasticity problem in a long hollow cylinder. The inner boundary conditions are the traction and the fluid temperature imposed on the inner surface of the cylinder, whereas the outer boundary is subjected to the ambient fluid temperature and is free of traction. This problem is solved by a finite element method in which the spatial and the time variables are discretized by several schemes. The study shows that the central explicit scheme for space discretization combined with a time marching scheme which incorporates moderate damping is suitable for this particular problem. Numerical results of the temperature and stress responses due to a modified step or single pulse are presented and discussed. One interesting observation is that, under high rate of stress loading, the coupling in the energy equation could generate temperature variations of significant magnitude. Author (GRA)

N84-10844# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
EVALUATION OF FOURIER DESCRIPTORS FOR TARGET RECOGNITION IN DIGITAL IMAGERY Final Technical Report
O. R. Mitchell and T. A. Grogen Griffiss AFB, N.Y. RADC Feb. 1983 21 p refs
(Contract F30602-78-C-0148)
(AD-A130182; RADC-TR-83-33) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report describes the mathematical processes involved in generating co-efficients from a binary image of an object. It includes fourier descriptor theory, the normalized fourier descriptor, description of system implementation with library generation, chain code format, normalized Fourier descriptor calculation, feature vector format, feature reduction, unknown feature vector extraction, feature vector classification and results applied to target recognition. Author (GRA)

N84-10845# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Computer Science.
BULK AVAILABILITY
Clifford Marshall Feb. 1983 56 p refs
(Contract N00014-75-C-0858)
(AD-A129863; POLY-EE/CE-83-001) Avail: NTIS HC A04/MF A01 CSCL 12/1

A mathematical model is given for the definition and analysis of bulk availability. Bulk availability is achieved by having some specified percentage of a total set of components operational. The model is deterministic rather than stochastic. Availability warranties are considered for the bulk availability model. GRA

N84-10846# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
A FAST HEURISTIC BASED ON SPACEFILLING CURVES FOR MINIMUM-WEIGHT MATCHING IN THE PLANE
John J. Bartholdi, III and Loren K. Platzman Apr. 1983 10 p refs
(Contract N00014-83-K-0147)
(AD-A129857; PDRC-83-03) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors present a heuristic to find a good matching on n points in the plane. It is essentially sorting and so runs in O(n log n) time (worst case) or linear expected time. Its performance is competitive with that of previously suggested methods. However, it has the advantages of being trivial to code and of being indifferent to the choice of metric or the probability distribution from which the points are drawn. GRA

N84-10847# Army Military Personnel Center, Alexandria, Va.
A SPECIAL BOUNDED SEQUENTIAL PROCEDURE M.S. Thesis. Final Report
Robert G. Gorrie 22 Apr. 1983 82 p refs
(AD-A130403) Avail: NTIS HC A05/MF A01 CSCL 12/1

The concept of item by item sequential sampling has been developed from the Wald sequential probability ratio (SPR) test. The SPR plan for one-sided variables inspection is characterized by two parallel lines on a plot of the cumulative sum of observations T(n) versus accumulated sample size n. The operation of the plan is described by analyzing the sequence T(n). The number of observations, n, required for defining a course of action is a random variable, often characterized by large values of n before a decision is made. Truncation rules are required to prevent unacceptable

sample sizes even though convergence is guaranteed. This truncation increases the associated producer's and consumer's risk. Herein a sequential non-probability ratio (SNPR) plan is examined which is characterized by intersecting lines and thus an implicit truncation property. A heuristic algorithm to define the parameters of the plan is introduced. The algorithm produces an SNPR plan which provides the same levels of protection as the non-truncated SPR plan. GRA

N84-10848# Wisconsin Univ., Madison. Center for Mathematics Research.
A GENERALIZATION OF DENJOY'S THEOREM ON DIFFEOMORPHISMS OF THE CIRCLE
Glen Richard Hall May 1983 16 p refs Sponsored in part by NSF
(Contract DAAG29-80-C-0041)
(AD-A130575; MRC-TSR-2516) Avail: NTIS HC A02/MF A01 CSCL 12/1

Discrete dynamical systems on manifolds, i.e., iterates of a map from a manifold to itself, can serve as simple qualitative models of real systems in physics, biology, and other sciences. Even maps on manifolds of low dimension (one and two) have been used as models since complicated dynamics often appear already in this setting. Often, when one is studying a model of a physical or biological system, one is particularly interested in the stable orbits, i.e. if a small error is made in setting the initial conditions, it would be hoped that this error would not grow with time, and, even better, that it would decay with time. Such stable orbits have long been observed, e.g., stable fixed points, periodic orbits form the most elementary examples. It was shown by Denjoy that for maps which are sufficiently smooth diffeomorphisms of the circle, these are the only examples of stable orbits, i.e., any stable orbit must be asymptotic to a periodic orbit. In this report the authors attempts to generalize this theorem to diffeomorphisms on two dimensional manifolds. The theorem given requires the extra condition that the map be expansive off the stable set, and presented is an easy example which shows that some additional technical condition will be necessary if expansive is to be removed. GRA

N84-10849# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE SUPERLINEAR AMBROSETTI-PRODI PROBLEM
Djairo G. deFigueiredo (Brasilia Univ.) May 1983 22 p refs
(Contract DAAG29-80-C-0041)
(AD-A130574; MRC-TSR-2522) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper establishes the existence of two solutions for some problems of the Ambrosetti-Prodi type. The following result is a sample of the results. The author uses the method of monotone iterations to obtain the first solution and a variational argument to get the second. The variational solution is subsequntly regularized. GRA

N84-10850# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A SUBDIVISION ALGORITHM IN CONFIGURATION SPACE FOR FINDPATH WITH ROTATION
Rodney A. Brooks and Tomas Lozano-Perez Dec. 1982 42 p refs
(Contracts N00014-81-K-0494; N00014-80-C-0505; N00014-82-K-0334)
(AD-A130565; AI-M-684) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper the authors present an algorithm for finding collision-free paths for a rigid polygonal object moving through space that is cluttered with obstacle polygons. The paths can include rotations of the object. The algorithm will find a path from a given initial position and orientation to a goal position and orientation if such a path exists, subject only to a user-specified resolution limit on displacements. The problem addressed here is an instance of the problem known as the findpath or mover's problem in robotics. The problem arises when planning the motion of a robot manipulator or mobile robot in an environment with known obstacles. GRA

N84-10851# Wisconsin Univ., Madison. Center for Mathematics Research.
IMPLICATIONS OF ANALYTICAL INVESTIGATIONS ABOUT THE SEMICONDUCTOR EQUATIONS ON DEVICE MODELING PROGRAMS
Ch. Ringhofer (Inst. fuer Allgemeine Elektrotechnik und Elektronik) and S. Selberherr Apr. 1983 54 p refs Sponsored in part by Siemens AG
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A130549; MRC-TSR-2513) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper gives guidelines for the development of computer programs for the numerical simulation of semiconductor devices. For this purpose the basic mathematical results on the corresponding elliptic boundary value problem are reviewed. In particular, existence, smoothness and structure of the solutions of the fundamental semiconductor equations are discussed. Various feasible approaches to the numerical solution of the semiconductor equations are described. Much emphasis is placed on constructive remarks to help authors of device simulation programs to make decisions on their code design problems. In particular, criteria for an optimal mesh generation strategy are given. The iterative solution of the systems of nonlinear and linear equations obtained by discretising the semiconductor equations is discussed. An example is given showing the power of these concepts combined with modern numerical methods in comparison to classical approaches. Author (GRA)

N84-10852# Wisconsin Univ., Madison. Center for Mathematics Research.
FINGERS IN A HELE-SHAW CELL WITH SURFACE TENSION
Jean-Marc Vanden-Broeck May 1983 13 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A130548; MRC-TSR-2518) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two dimensional flow in a porous medium may be studied by using an analogue proposed by Hele-Shaw. The analogue is based on the fact that the mean velocity in a two dimensional porous medium and the velocity of the flow between two parallel plates satisfy the same equations. In the present paper the author considers the steady two dimensional flow produced by a finger advancing between the two plates. The analogous porous medium flow occurs in oil recovery. This problem was first considered by Saffman and Taylor. They obtained an exact solution for zero surface tension. McLean and Saffman generalized the result of Saffman and Taylor by including the effect of surface tension at the interface. They solved the problem numerically and obtained one family of solutions. In the present paper the problem is solved by a different numerical scheme. The results suggest the existence of a countable number of solutions for non-zero surface tension. This infinite set of solutions contains the solution previously obtained by McLean and Saffman. GRA

N84-10853# Wisconsin Univ., Madison. Center for Mathematics Research.
MULTIPLE CRITICAL POINTS OF INVARIANT FUNCTIONALS AND APPLICATIONS
D. G. Costa (Brasilia Univ.) and M. Willem (Univ. Catholique de Louvain) Jun. 1983 19 p refs
(Contract DAAG29-80-C-0041)
(AD-A130544; MRC-TSR-2532) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with some multiplicity results of periodic orbits of Hamiltonian systems and for solution of a non-linear Dirichlet problem. These results follow from an abstract theorem of Lusternik-Schnirelman type as applied to an invariant equation of the form Lu + delta F(u) = 0 in a Hilbert space x = L sub 2 (omega; R sub n), where L is an unbounded self-adjoint operator and F is a C sub 1 strictly convex function. Author (GRA)

N84-10854# Wisconsin Univ., Madison. Center for Mathematics Research.
DIRECTIONALLY EFFICIENT ROBUST ESTIMATORS OF LOCATION VIA EXPONENTIAL EMBEDDING
Wei-Yin Loh May 1983 41 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A130525; MRC-TSR-2523) Avail: NTIS HC A03/MF A01 CSCL 12/1

A general method is presented for constructing a location estimator which is asymptotically efficient at any two different location-scale families of symmetric distributions as well as at an appropriately defined class of distributions lying in between. The method works by embedding the two families in a comprehensive parametric model and identifying the estimator with the MLE (Maximum Likelihood Estimation). The case when the families are Normal and Double exponential is examined in detail.
Author (GRA)

N84-10855# Wisconsin Univ., Madison. Center for Mathematics Research.
ON COMPLEX RATIONAL APPROXIMATION BY INTERPOLATION AT PRESELECTED NODES
Lothar Reichel Apr. 1983 35 p refs
(Contract DAAG29-80-C-0041)
(AD-A130526; MRC-TSR-2514) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let omega be a finitely connected closed point set in the complex plane with a piecewise smooth boundary. The approximation of functions analytic on omega by rational functions determined by interpolation or least squares approximation at preselected nodes is discussed. Attention is focussed on simple methods for selecting an appropriate rational space and obtaining a fairly well-conditioned rational basis. Applications include the determination of conformal mappings. Numerical examples illustrate the approximation method. Author (GRA)

N84-10856# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 94.
ON PERTURBATION THEORY
Laurence G Taff 1 Jun. 1983 48 p refs
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A130213; ESD-TR-83-023; TR-650) Avail: NTIS HC A03/MF A01 CSCL 12/1

Perturbation theory in celestial mechanics has a long, rich history of failure stretching back to Newton. I believe that the causes of this are two-fold. One problem is the difficulty of dealing with the mathematical structure used in celestial mechanics to express perturbation theory as opposed to the constructs used in field theories (e.g., trajectory equations vs. linear second order partial differential equations). The second flows directly from this and relates to the misapplications of certain mathematical techniques (averaging, series expansions) within the context of perturbation theory. These incorrect analyses usually appear in second-order theories such as Kozai's (1959) artificial satellite theory. Ideally this report would clearly illustrate the nature of these difficulties utilizing a complex (but exactly soluble) physical model intimately tied to the two-body problem and then go on to lay the foundations for a new perturbation theory. I believe that that's exactly what is accomplished herein except that the hints of the base of this new mathematical formalism are severely limited. The exactly soluble physical model is the three dimensional harmonic oscillator complicated by anisotropic terms, anharmonic terms, and air resistance. The deep connection is provided by Bertrand's theorem which is also proved. Author (GRA)

N84-10857# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.
SOLUTION MANIFOLDS AND SUBMANIFOLDS OF PARAMETRIZED EQUATIONS AND THEIR DISCRETIZATION ERRORS
James P. Fink and Werner C. Rheinboldt Jan. 1983 44 p refs
(Contract N00014-8-C-0455; Grants AF-AFOSR-0176-80; NSF MCS-78-05299)
(AD-A130186; ICMA-83-59) Avail: NTIS HC A03/MF A01 CSCL 12/1

The paper concerns solution manifolds of nonlinear parameter-dependent equations (1) F(u,lambda) = y sub o involving a Fredholm operator F between (infinite-dimensional) Banach spaces X = Z x lambda and Y, and a finite-dimensional parameter space lambda. Differential-geometric ideas are used to discuss the connection between augmented equations and certain one-dimensional submanifolds produced by numerical path-tracing procedures. Then, for arbitrary (finite) dimension of lambda, estimates of the error between the solution manifold of (1) and its discretizations are developed. These estimates are shown to be applicable to rather general nonlinear boundary-value problems for partial differential equations. Author (GRA)

N84-10858# Wisconsin Univ., Madison. Center for Mathematics Research.
ASYMPTOTIC BEHAVIORS OF THE SOLUTION OF AN ELLIPTIC EQUATION WITH PENALTY TERMS
Hideo Kawarada (Tokyo Univ.) and Takao Hanada (Univ. of Electro-Communications) Jun. 1983 27 p refs
(Contract DAAG29-80-C-0041)
(AD-A130473; MRC-TSR-2533) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors study the boundary value problem for an elliptic equation with penalty terms. This problem approximates the boundary value problems with three types of homogeneous boundary conditions; the Dirichlet boundary condition, the Neumann boundary condition, and the mixed boundary condition. They discuss asymptotic behaviors of the solutions of the above mentioned problems as the coefficient of the penalty term tends to zero. By using one of these properties, they can approximate the outward normal derivative defined on the boundary of the approximated problem prescribed with the Dirichlet condition, which is efficiently available to obtain the numerical solution of free boundary problems of various types. GRA

N84-10859# Stanford Univ., Calif. Dept. of Computer Science.
ADAPTIVE MESH REFINEMENT FOR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS
Marsha J. Berger and Joseph Oliger Mar. 1983 57 p refs
(Contract N00014-75-C-1132; NSF MCS-77-02082)
(AD-A130162) Avail: NTIS HC A04/MF A01 CSCL 12/1

The authors present an adaptive method based on the idea of multiple, component grids for the solution of hyperbolic partial differential equations using finite difference techniques. Based upon Richardson-type estimates of the truncation error, refined grids are created or existing ones removed to attain a given accuracy for a minimum amount of work. Their approach is recursive in that fine grids can themselves contain even finer grids. The grids with finer mesh width in space also have a smaller mesh width in time, making this a mesh refinement algorithm in time and space. This document includes algorithm, data structures and grid generation procedure, and concludes with numerical examples in one and two space dimensions. Author (GRA)

N84-10860# Rome Air Development Center, Griffiss AFB, N.Y. EM Techniques Branch.
ON THE ODD-SYMMETRY OF MINIMUM PHASE-ONLY PERTURBATIONS
Robert A. Shore Feb. 1983 22 p refs
(AF Proj. 2305)
(AD-A130514; RADC-TR-83-26) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is proved that the minimum phase-only weight perturbations required to impose a single null in a real, linear array, antenna pattern are odd-symmetric with respect to a phase reference at the center of the array. Hence the perturbed pattern is likewise real. Additional evidence is given for supporting the hypothesis that the minimum phase-only weight perturbations are odd-symmetric for any number of imposed nulls. Author (GRA)

N84-10861# Wisconsin Univ., Madison. Center for Mathematics Research.
A LOCAL EXISTENCE AND UNIQUENESS THEOREM FOR A K-BKZ-FLUID
Michael Renardy Jun. 1983 19 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A130503; MRC-TSR-2530) Avail: NTIS HC A02/MF A01 CSCL 12/1

The existence theory for models of viscoelastic fluids has so far not been very well developed, in particular in three dimensional situations. An existence theorem for a particular class of models is proved. This theory is based on a postulated analogy with hyperelasticity. It is assumed that the fluid occupies all of space. Abstract methods developed originally for quasilinear hyperbolic systems can be used to prove the well-posedness of the initial value problem. GRA

N84-10862# Wisconsin Univ., Madison. Center for Mathematics Research.
CONSTRAINED NONLINEAR LEAST SQUARES
George E. P. Box and Hiromitsu Kanemasu (World Bank) Jun. 1983 27 p refs
(Contract DAAG29-80-C-0041)
(AD-A130502; MRC-TSR-2531) Avail: NTIS HC A03/MF A01 CSCL 12/1

The method of least squares is widely used for the fitting of data of functions containing unknown parameters. When these functions are non-linear in the parameters an iterative approach using successive local linearizations was suggested by Gauss. To encourage convergence various modifications and alternatives have been suggested. It has been proposed that, at the early stages, use of the method of steepest descent might speed convergence. A method might be used in which changes were made in the direction of, but not of the magnitude of, the Gauss adjustment. It is convenient to call this the Gauss direction method. Levenberg and later Marquardt proposed a spherically constrained procedure. The procedure could be made scale-invariant to render its behavior independent of the (arbitrary) units in which the parameters were measured. It was argued the resulting method offered an appropriate compromise between steepest descent and Gauss's method. In this report some of the geometry of these methods is discussed. As a consequence it is argued that the procedure should also be made invariant under linear transformation. With this modification the scale-invariant Levenberg-Marquardt method becomes inappropriate and the steepest descent direction and the Gauss direction method identical. It remains, therefore, to determine how far along the Gauss direction one should proceed. Two alternative methods for deciding this are suggested. Both methods use quantities already available from previous calculations. GRA

N84-10863# Wisconsin Univ., Madison. Center for Mathematics Research.
GRANULAR JUMPS DOWN AN INCLINED PLANE
M. C. Shen Jun. 1983 23 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A130501; MRC-TSR-2529) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document studies granular jumps generated in the gravity flow of granular materials down an inclined plane. The equations governing the granular flow are reduced to a sequence of boundary value problems of linear ordinary differential equations by means of an asymptotic method. Their solutions are used to determine the Burgers equation, which possesses a progressive wave solution to describe a smooth granular jump. The wave speed and a criterion for the stability of the granular jump are also obtained.
Author (GRA)

N84-10864# Stanford Univ., Calif. Dept. of Computer Science.
A SYSTOLIC ARCHITECTURE FOR SINGULAR VALUE DECOMPOSITION
Robert Schreiber 1983 6 p refs Presented at the 1st Intern. Colloq. on Vector and Parallel Computing in Sci. Appl., Paris, Mar. 1983 Sponsored in part by ESL, Inc., Sunnyvale, Calif.
(Contract N00014-82-K-0703)
(AD-A130098) Avail: NTIS HC A02/MF A01 CSCL 12/1

Systolic arrays are highly parallel computing structures specific to particular computing tasks. They are well-suited for reliable and inexpensive implementation using many identical VLSI components. The designs consist of one and two dimensional lattices of identical processing elements. Communication of data occurs only between neighboring cells. Control signals propagate through the array like data. These characteristics make it feasible to construct very large arrays. Several modern methods in digital signal processing require real time solution of some of the basic problems of linear algebra. Fortunately systolic arrays have been developed for many of these problems. But several gaps remain. Only partially satisfying results have been obtained for the eigenvalue and singular value decompositions, for example. This document considers a systolic array for the singular value decomposition (SVD). In this paper the author discusses two topics. First, he shows how an architecture for computing the eigenvalues of a symmetric matrix can be modified to compute singular values and vectors. Second, he discusses the implementation using VLSI chips of these systolic eigenvalue and SVD arrays. GRA

N84-10865# California Univ., Berkeley. Center for Pure and Applied Mathematics.
ACCURATE COMPUTATION OF DIVIDED DIFFERENCES OF THE EXPONENTIAL FUNCTION
A. C. McCurdy, K. C. Ng, and B. N. Parlett Jun. 1983 68 p refs
(Contract N00014-76-C-0013)
(AD-A130306; CPAM-160) Avail: NTIS HC A04/MF A01 CSCL 12/1

The traditional recurrence for the computation of exponential divided differences, along with a new method based on the properties of the exponential function, are studied in detail in this paper. Our results show that it is possible to combine these two methods to compute exponential divided differences accurately. A hybrid algorithm is presented for which our error bound grows quite slowly with the order of the divided difference. Author (GRA)

N84-10866# Illinois Univ., Chicago. Dept. of Mathematics, Statistics and Computer Science.
A COLLECTION OF A-OPTIMAL DESIGNS FOR CONTROL-TEST TREATMENT COMPARISONS, PART 1
A. S. Heydayat and D. Majumdar Mar. 1983 36 p refs
(Grant AF-AFOSR-0170-80; AF Proj. 2304)
(AD-A129322; AFOSR-83-0462TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A-optimal designs for comparing v test treatments with a control in b blocks of size k each are considered. 111 such designs are given when the parameters are in the range: $2 < \text{or} = k < \text{or} = 8$, $k < \text{or} = v < \text{or} = 30$, $v < \text{or} = b < \text{or} = 50$.
Author (GRA)

N84-10867# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
ROBUST ABLUE'S (ASYMPTOTICALLY BEST LINEAR UNBIASED ESTIMATORS) FOR LOCATION AND SCALE PARAMETER ESTIMATION
R. L. Eubank and H. J. Lindsey Apr. 1983 19 p refs Prepared in cooperation with Delaware Univ., Newark
(Contract N00014-82-K-0207; NR Proj. 042-479)
(AD-A130752; TR-175) Avail: NTIS HC A02/MF A01 CSCL 12/1

A robust procedure for location and/or scale parameter estimation is presented which utilizes the (asymptotically best linear unbiased estimators) (ABLUE's) based on k(less than N) of the N sample quantiles. Using regression design techniques a method is developed for selecting sample quantiles which furnishes the corresponding parameter estimates with good robustness properties relative to a given finite set of known probability laws. The problems of robust quantile selection for the estimation of a particular population quantile or in the presence of left and/or right hand censoring are also considered. GRA

N84-10868# Texas Univ., Austin. Inst. for Computing Science and Computer Applications.
A FULLY AUTOMATIC PROOF OF AN ORDERED TREE INSERTION FUNCTION
Robert S. Boyer and J. Strother Moore May 1983 51 p refs
(Contract N00014-81-K-0634; Grant NSF MCS-82-02943; NR Proj. 049-500)
(AD-A130720; ICSCA-CMP-36) Avail: NTIS HC A04/MF A01 CSCL 12/1

The authors define the concept of an ordered binary tree, the concept that a number occurs in such a tree, and a function that is purported to insert a number into such a tree. They then show a fully automatic proof that the insertion function is correct. The machine proves the following three theorems without any help whatsoever. First, the recursive equation describing the insertion function is satisfied by one and only one function - in particular, the machine proves that the recursion always terminates. Second, if X is an ordered tree and L is a number, then the result of inserting L into X is an ordered tree. Third, if X is an ordered tree and L and K are numbers, then L occurs in the result of inserting K into X if and only if either L=K or L already occurred in X.
Author (GRA)

N84-10869# Naval Research Lab., Washington, D. C.
ON THE APPLICATION OF OPTICAL SIGNAL PROCESSING TO THE SOLUTION OF RICCATI EQUATIONS Interim Report
H. N. Ho 21 Jul. 1983 22 p refs
(XF12143091)
(AD-A130710; NRL-MR-5143) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Riccati equation encountered in continuous Kalman filtering is studied. For the case of a system with constant (or piecewise constant) coefficient matrices the solution of the Riccati equation is presented in the form of a recursive relationship that does not require matrix inversion. A functional design of an iterative optical processor for performing the recursive solution of the Riccati equation is presented. Certain other issues of optical signal processing such as handling of bipolar or complex data and techniques for increased accuracy are also briefly discussed.
Author (GRA)

N84-10870# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
REJECTION OF MULTIVARIATE OUTLIERS
Bimal Kumar Sinha May 1983 31 p refs
(Contract F49620-82-K-0001)
(AD-A130686; AFOSR-83-0628TR; TR-83-08) Avail: NTIS HC A03/MF A01 CSCL 12/1

An extension of Ferguson's univariate normal results for rejection of outliers is made to the multivariate case with mean slippage. The formulation is more general than that in Schwager and Margolin and the approach is also different. The main result can be viewed as a robustness property of Mardia's locally optimum multivariate normal kurtosis test to detect outliers against non-normal multivariate distributions.
GRA

N84-10871# Stanford Univ., Calif. Dept. of Operations Research.
SIMULATION OF NON-MARKOVIAN SYSTEMS
Donald L. Iglehart and Gerald S. Shedler Jun. 1983 27 p refs
(Contract N00014-76-C-0578; Grant NSF MCS-79-09139; NR Proj. 043-343)
(AD-A130837; TR-66) Avail: NTIS HC A03/MF A01 CSCL 12/1

A generalized semi-Markov process provides a stochastic process model for a discrete-event simulation. This representation is particularly useful for non-Markovian systems where it is nontrivial to obtain recurrence properties of the underlying stochastic processes. The authors develop geometric trials arguments which can be used to obtain results on recurrence and regeneration in this setting. Such properties are needed to establish estimation procedures based on regenerative processes. Applications to modeling and simulation of ring and bus networks are discussed.
Author (GRA)

N84-10872# Naval Underwater Systems Center, Newport, R.I. Weapon Systems Dept.
THE FAST FOURIER TRANSFORM AS A SIGNAL PROCESSING TECHNIQUE
C. A. Ledoux 10 May 1983 42 p
(AD-A131011; NUSC/TD-6148) Avail: NTIS HC A03/MF A01 CSCL 12/1

The proliferation of digital equipment for use in making all types of measurements has necessitated drastic changes in the signal detection techniques used to quantify measured signals. More specifically, there has been an increased use of the kinds of digitizers whose output consists of sequential time slices of the measured signal in binary coded values that correspond to amplitude and time. This type of information is directly transferrable to a computer memory, where it can be processed by a wide variety of digital techniques. One of the most useful digital processes used to resolve amplitude and phase spectra from a digitized time-domain signal is the fast Fourier transform (FFT). This document attempts to give the reader a sound understanding of what the FFT does and how it can be applied to various measurement needs.
Author (GRA)

N84-10873# California Univ., Berkeley. Center for Pure and Applied Mathematics.
A NUMERICAL ANALYST'S JORDAN CANONICAL FORM Ph.D. Thesis Final Report
James Weldon Demmel May 1983 150 p refs
(Contracts N00014-76-C-0013; DE-AM03-76SF-00034; DE-AS03-79ER-10358)
(AD-A130775; PAM-156) Avail: NTIS HC A07/MF A01 CSCL 12/1

What does it mean to compute an eigendecomposition of an uncertain matrix? Because of measurement errors and roundoff errors, one must typically compute the eigenvalues and eigenvectors not of a single matrix but rather of a ball of matrices whose radius depends on the uncertainty in the data. We approach this problem by asking how to partition the eigenvalues of the matrices in the ball into nonoverlapping groups which cannot themselves be further partitioned. More specifically, we define the dissociation of two subsets sigma sub 1 and sigma sub 2 = sigma x sigma sub 1 of the sets of eigenvalues sigma of a matrix T as the smallest perturbation of T that will make some eigenvalue from sigma sub 1 and some eigenvalue from sigma sub 2 move together and become indistinguishable. The results of this thesis are of two kinds. First, we compute upper and lower bounds on the dissociation which improve bounds in the literature. Both upper and lower bounds are achievable or nearly so. The upper and lower bounds are often close together but occasionally far apart. Our second set of results quantifies this last statement by assuming a probability density on the set of matrices and computing the likelihood that the bounds are far apart. This approach leads to numerous other probabilistic results, such as the distribution of the condition number of a random matrix, and the distribution of the distance from a random matrix to one with a given Jordan form.
GRA

N84-10874# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
LIKELIHOOD RATIO TESTS ON COVARIANCE MATRICES AND MEAN VECTORS OF COMPLEX MULTIVARIATE NORMAL POPULATIONS AND THEIR APPLICATIONS IN TIME SERIES
P. R. Krishnaian, J. C. Lee (Bell Telephone Labs.), and T. C. Chang (Cincinnati Univ.) Mar. 1983 68 p refs
(Contract F49629-82-K-0001; AF Proj. 2304)
(AD-A131523; AFOSR-83-0692TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper, the authors reviewed the literature on computational aspects of the distributions of the likelihood ratio statistics for testing various hypotheses on the covariance matrices and mean vectors of complex multivariate normal populations. Applica-

tions of some of these test procedures in the area of inference on multiple time series in the frequency domain are also discussed. In the Appendix, the authors give tables which are useful in implementation of various likelihood ratio test statistics discussed in this paper. GRA

N84-10875# ALPHATECH, Inc., Burlington, Mass.
SENSOR CORRELATION AND DATA FUSION THEORY Final Report, 1 May 1980 - 31 Apr. 1983
Nils R. Sandell, Jr. Jun. 1983 74 p refs
(Contract F49620-81-C-0015; AF Proj. 2304)
(AD-A131510; AFOSR-83-0671TR; TR-167) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report describes the results obtained during the second year of a program of continuing research in the mathematical problems associated with the analysis and design of Air Force sensor correlation and data fusion systems. These systems play a vital role in the command and control process, but there presently exists no systematic and quantitative methodology for their analysis and design. In the first year of research, ALPHATECH investigated an important subproblem: the distributed detection problem associated with determining the presence or absence of targets from a collection of distributed sensors. In the second year of research, ALPHATECH has obtained novel, exact expressions for the probability density functions of the local log likelihood rations, and has used these expressions to generate an extensive set of design curves. In the third year of research, which is presently on-going, being investigated is another important class of problems, namely, sequential distributed detection problems. Author (GRA)

N84-10876# Pennsylvania State Univ., University Park. Lab. for Applied Research.
CLUSTERING OF THE LEAST SQUARES LATTICE PARCOR (PARTIAL CORRELATION) COEFFICIENTS: A PATTERN-RECOGNITION APPROACH TO STEADY STATE SYNTHETIC VOWELL IDENTIFICATION M.S. Thesis
Beth Anne Cooper Aug. 1983 124 p refs
(Contract N00024-79-C-6043)
(AD-A131503; ARL/PSU/TM-83-90) Avail: NTIS HC A06/MF A01 CSCL 12/1

The partial correlation (PARCOR) coefficients of the least squares lattice filter may be used to conveniently and efficiently represent various types of acoustic signals. Because a stationary time series may be represented by a small number of PARCOR coefficients, the PARCOR coefficients have been widely used as effective pattern recognition parameters for the representation and transmission of information. This thesis establishes the PARCOR coefficients of the least squares lattice filter as efficient and effective pattern recognition features for the classification and identification of synthesized steady state vowel-like sounds. The PARCOR coefficient technique is shown to be a much quicker and more computationally efficient method of vowel identification than densification by formant frequencies, which involves the computations of poles and zeroes and the back-calculation of formant frequencies and format bandwidths. Author (GRA)

N84-10877# Brown Univ., Providence, R. I. Center for Dynamical Systems.
STABLE EQUILIBRIA IN A SCALAR PARABOLIC EQUATION WITH VARIABLE DIFFUSION
G. Fusco (Univ. Degli Studi di Roma) and J. K. Hale 25 Mar. 1983 29 p refs Sponsored in part by CNR and NATO
(Contract DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-82-05355; AF Proj. 2304)
(AD-A131221; AFOSR-83-0673TR; LCDS-83-10) Avail: NTIS HC A03/MF A01 CSCL 12/1

A scalar parabolic equation with nonconstant diffusion and nonlinear source term is considered and some aspects of the influence of changing the diffusion on existence, stability and bifurcation properties of the equilibria are discussed. Author (GRA)

N84-10878# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Div.
SURVEY OF ERROR PROPAGATION IN SYSTEMS
V. R. R. Uppuluri and Way Kuo Apr. 1983 20 p refs
(Contract W-7405-eng-26)
(DE83-009817; NUREG/CR-2839; ORNL/CSD/TM-190) Avail: NTIS HC A02/MF A01

Unlike classical sensitivity analysis which investigates the range of system performance, the distribution function of system performance studies error propagation analysis. Thus, error propagation analysis is essentially a statistical analysis. Research articles in error propagation are reviewed. An overview is presented of error propagation applied to various systems and models. A standard analysis procedure is also given. Finally, several conclusions are drawn. It is recommended that: (1) basic research on error propagation be carried out; (2) an efficient (least cost) method be developed to analyze large size problems; and (3) human error be included in the system modeling. DOE

N84-10879# California State Univ., Hayward.
INCOMPLETE-CHOLESKY FACTORIZATION BY A MATRIX-PARTITION ALGORITHM
29 Mar. 1983 14 p refs Presented at Conf. on Elliptic Probl. Solvers, Monterey, Calif., 10 Jan. 1983
(Contract W-7405-eng-48)
(DE83-013044; UCRL-88989; CONF-830116-3) Avail: NTIS HC A02/MF A01

Matrix partition algorithms for solving tridiagonal systems of equations are highly adaptable to parallel processors. In this paper, a matrix partition algorithm for generating a block-Cholesky factorization of a permuted form of a block tridiagonal system is presented. A preconditioning system based on an incomplete application of this algorithm is then described. Under certain dominance conditions, it is shown that the computations within a partition can be performed independently thus yielding a highly parallel incomplete-Cholesky factorization particularly suitable for multi-processing architectures. DOE

N84-10880# California Univ., Livermore. Lawrence Livermore Lab.
ELEMENT CHOICES FOR EXPLICIT AND IMPLICIT NONLINEAR FINITE-ELEMENT COMPUTATION. THE ISPRA COURSES ON STRUCTURAL DYNAMICS: LECTURE NOTES
G. L. Goudreau May 1983 30 p refs Lecture presented at Struct. Dyn. Meeting, Ispra, Italy, 16 May 1983
(Contract W-7405-eng-48)
(DE83-013041; UCRL-89172) Avail: NTIS HC A03/MF A01

The confrontation of the finite element technology with the awesome number crunching required for the nonlinear problem has forced a new assessment. The finite element community discovered that for impact, wave propagation and even slower impulsively driven dynamic problems, the finite difference hydrocodes were much more efficient, albeit requiring contorted mesh topologies to model practical geometries and fifty thousand time steps to follow a quasi-static process or reach static equilibrium. The experience of engineering analysis at the Lawrence Livermore National Laboratory has straddled both worlds, and the intent of this lecture is to review choices in the context of the two and three dimensional implicit and explicit Lagrangian codes developed in our Methods Development Group. The explicit DYNA2D and DYNA3D and implicit NIKE2D and NIKE3D of Hallquist form the focus of this discussion. DOE

N84-10881# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
COMPUTATION OF BESSEL FUNCTIONS OF COMPLEX ARGUMENT
D. E. Amos May 1983 41 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013528; SAND-83-0086) Avail: NTIS HC A03/MF A01

The mathematical basis for a computer subroutines package of Bessel functions including H sub nu sup (1) (z), H sub nu sup (2) (z), I/sub nu (z), J sub nu (z), K sub nu (z) and Y sub nu (z) for nonnegative orders nu greater than or equal to C and complex argument z in the cut plane - pi < arg z less than or equal to pi

is described. Results of parameter studies needed to terminate infinite processes with accuracies from 3 to 18 digits are shown. The Airy functions, spherical Bessel functions, and Kelvin functions of a complex argument are by-products of this development. DOE

N84-10882# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Dept.
KWIC INDEX FOR NUMERICAL LINEAR ALGEBRA
J. A. Carpenter Jul. 1983 69 p refs
(Contract W-7405-eng-26)
(DE83-014889; ORNL/CSD-120) Avail: NTIS HC A04/MF A01

This report is a sequel to ORNL/CSD-106 in the ongoing supplements to Professor A.S. Householder's KWIC Index for Numerical Algebra. Beginning with the previous supplement, the subject has been restricted to Numerical Linear Algebra, roughly characterized by the American Mathematical Society's classification sections 15 and 65F but with little coverage of infinite matrices, matrices over fields of characteristics other than zero, operator theory, optimization and those parts of matrix theory primarily combinatorial in nature. Some consideration is given to the uses of graph theory in Numerical Linear Algebra, particularly with respect to algorithms for sparse matrix computations. The period covered by this report is roughly the calendar year 1982 as measured by the appearance of the articles in the American Mathematical Society's Contents of Mathematical Publications lagging actual appearance dates by up to nearly half a year. The review citations are limited to the Mathematical Reviews (MR). DOE

N84-10883# Stanford Univ., Calif. Systems Optimization Lab.
NUMERICAL SOLUTION OF SYSTEMS OF SIMULTANEOUS POLYNOMIAL EQUATIONS
Adam N. Rosenberg Jul. 1983 39 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; Grants NSF MCS-79-26009; NSF ECS-80-12974; NSF MCS-81-21838) (DE83-015832; DOE/ER-72018/T12; TR-SOL-83-10) Avail: NTIS HC A03/MF A01

A program for finding all realand complex solutions to a system of simultaneous polynomial equations is developed and tested. The program uses a homotopy method to follow paths from solutions of an easy system of equations to solutions of the system of equations being solved. A continuous path-following method takes advantage of the differential information available and does not require the structure of a subdivision to be superimposed on the structure of the problem, as would be the case with a piecewise-linear method. The numerical methods used in the program are chosen empirically. The way an algorithm misbehaves tells about the problem being solved and suggests computational techniques. Problems synthesized by random number generators and problems from other sources are solved by the program. It finds all but a few roots for most systems the size of three quartics in three unknowns or five quadratics in five unknowns. Isolated roots are accurate to machine precision. DOE

N84-10884# Rice Univ., Houston, Tex. Aerp
COMPUTATIONAL METHODS FOR STATIC AND DYNAMIC SYSTEMS AND ENGINEERING APPLICATIONS Final Report
A. Miele 1983 32 p refs
(Grant NSF ENG-79-18667)
(PB83-227314; AAR-167; NSF/ECS-83006) Avail: NTIS HC A03/MF A01 CSCL 12A

Research on computational methods of interest for static systems and dynamic systems, with particular regard to engineering applications, is summarized. The principal topics discussed include optimally properties of the gradient phase of gradient restoration algorithms, restoration algorithm for solving optimal control problems with nondifferential constraints and general boundary conditions. Chebyshev minimax problems of optimal control and modified quasilinearization algorithm for optimal control problems with nondifferential constraints and general boundary conditions are presented. GRA

N84-10885# Rice Univ., Houston, Tex. Astro-Astronautics Group.
MODIFIED QUASILINEARIZATION ALGORITHM FOR OPTIMAL CONTROL PROBLEMS WITH NONDIFFERENTIAL CONSTRAINTS AND GENERAL BOUNDARY CONDITIONS. PART 1: THEORY
A. Miele, Y. M. Kuo, and E. M. Coker 1982 50 p refs
(Grant NSF ECS-79-18667)
(PB83-226944; AAR-161-Pt-1; NSF/ECS-82078-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 12A

The numerical solution of two classes of optimal control problems, problem (P1) and problem (P2), is considered. Problem (P1) involes a functional I, subject to differential constraints and general boundary conditions. It consists of finding the state, the control, and the parameter so that the functional I is minimized while the constraints and the boundary conditions are satisfied to a predetermined accuracy. Problem (P2) extends problem (P1) to include nondifferential constraints to be satisfied everywhere along the interval of integration. Algorithms are developed for both problems. Several numerical examples are presented to illustrate the performance of these algorithms. Results reveal the feasibility as well as the convergence characteristic of the algorithms. GRA

N84-10886# Rice Univ., Houston, Tex. Astro-Astronautics Group.
MODIFIED QUASILINEARIZATION ALGORITHM FOR OPTIMAL CONTROL PROBLEMS WITH NONDIFFERENTIAL CONSTRAINTS AND GENERAL BOUNDARY CONDITIONS. PART 2: EXAMPLES
A. Miele, Y. M. Kuo, and E. M. Coker 1982 60 p refs
(Grant NSF ECS-79-18667)
(PB83-226936; AAR-162-Pt-2; NSF/ECS-82079-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 12A

A modified quasilinearization algorithm for minimizing a functional subject to differential constraints, nondifferential constraints, and general boundary conditions, is discussed. Several numerical examples are presented to illustrate the performance of the algorithms associated with two classes of optimal control problems, problem (P1) and problem (P2). Problem (P1) involves a functional I, subject to differential constraints and general boundary conditions. It consists of finding the state, the control, and the parameter so that the functional I is minimized while the constraints and the boundary conditions are satisfied to a predetermined accuracy. Problem (P2) extends problem (P1) to include nondifferential constraints to be satisfied everywhere along the interval of integration. Numerical results show the rapid convergence characteristics of the modified quasilinearization algorithm. GRA

N84-10887# Illinois Univ., Urbana-Champaign. Decision and Control Lab.
RESEARCH INITIATION: AGGREGATED HIERARCHICAL CONTROL Final Report
Douglas P. Looze Jan. 1983 78 p refs
(Grant NSF ENG-79-08778)
(PB83-226761; NSF/ECS-83002) Avail: NTIS HC A05/MF A01 CSCL 12A

The extension of the techniques of hierarchical control theory to encompass a larger class of problems is discussed. The class of iterative algorithms considered is the class of one point iterations defined by a monitor splitting of f where x is a reflexive Banach space and f (x) equals O. The problem of finding the best decentralized control for a linear stochastic interconnected system with a quadratic cost is considered and two general applications of hierarchical algorithms are examined. The first algorithm applies the interaction prediction algorithm to the specific problem structure of a linear-quadratic-Gaussian decentralized control problem. The second algorithm addresses the linear quadratic robust control problem of finding a single feedback gain for a number of different system models which minimizes a sum of quadratic costs for the models. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-10888# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
A NOTE ON OPTIMAL AND ROBUST SPACING SELECTION
Randall L. Eubank Jun. 1983 13 p refs
(Contract N00014-82-K-0207)
(AD-A130427; SMU/DS/TR-176) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of quantile selection for the asymptotically best linear unbiased estimators of location and scale parameters is considered. The asymptotic properties of several quantile selection methods for simultaneous parameter estimation are derived and simple approximate solutions are provided. A robust scheme for quantile selection is also developed. Author (GRA)

N84-10889# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
MINIMUM DISTANCE ESTIMATION OF MIXTURE MODEL PARAMETERS: ASYMPTOTIC RESULTS AND SIMULATION COMPARISONS WITH MAXIMUM LIKELIHOOD
Wayne A. Woodward, William C. Parr, William R. Schucany, and Henry L. Gray Jun. 1983 27 p refs
(Contract N00014-82-K-0207; NR Proj. 042-479)
(AD-A130426; SMU/DS/TR-178) Avail: NTIS HC A03/MF A01 CSCL 12/1

The estimation of mixing proportions in the mixture model is discussed with emphasis on the mixture of two normal components with all five parameters unknown. Simulations are presented which compare minimum distance (MD) and maximum likelihood (ML) estimation of the parameters of this mixture-of-normals model. Some practical issues of implementation of these results are also discussed. Simulation results indicate that ML techniques are superior to MD when component distributions actually are normal, while MD techniques provide better estimates than ML under symmetric departures from component normality. Results are presented which establish strong consistency and asymptotic normality of the MD estimator under conditions which include the mixture-of-normals model. Asymptotic variances and relative efficiencies are obtained for further comparison of the MDE and MLE. Author (GRA)

N84-10890# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON TWO-STAGE BAYES SELECTION PROCEDURES
Shanti S. Gupta and Klaus J. Miescke (Illinois Univ., Chicago) Jun. 1983 22 p refs
(Contract N00014-75-C-0455)
(AD-A130301; TR-83-22) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let Pi sub 1,..,Pi sub K be normal populations with unknown means and a common known variance. The goal is to find the population with the largest mean. Two-stage procedures with screening at the first stage are studied in a Bayesian approach. They are based on k samples of common size n sub 1 drawn at Stage 1, and on samples of common size n sub 2 drawn at Stage 2 from all those populations which have not been screened out at Stage 1. If only one population is selected at Stage 1, the procedure stops at Stage 1. Under the assumption of a specific loss function which includes costs of sampling, a Bayes procedure is derived with respect to i.i.d. normal priors. Its properties are discussed and several approximations are considered. The expected value of the maximum of k independent normals with known but distinct means and a common known variance plays a crucial rule in the determination of the Bayes procedure.
Author (GRA)

N84-10891# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
OPTIMAL SAMPLING IN SELECTION PROBLEMS
Shanti S. Gupta Jun. 1983 14 p refs
(Contract N00014-75-C-0455)
(AD-A130248; TR-83-21) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper describes several optimal sampling problems that arise in connection with selection and ranking procedures. A selection procedure typically consists of three ingredients: (1) a sampling rule, (2) a stopping rule, and (3) a decision rule, though these components are not usually explicitly so labeled. The problem of optimal sampling arises in different ways depending on the context of the problem at hand. Broadly speaking, the problem of optimal (or optimum) sampling arises because of the need for balancing between the cost of sampling and the cost of making a wrong decision. Obviously, increasing the amount of sampling increases the former cost while decreasing the latter. GRA

N84-10892# Athens Univ. (Greece). Statistical Unit.
OCCUPANCY MODELS, BELL-TYPE POLYNOMIALS AND NUMBERS AND APPLICATIONS TO PROBABILITY Final Technical Report
T. Cacoullos Jun. 1983 68 p refs
(Contract DAJA37-80-C-0264; DA Proj. 1T1-61102-BH-57)
(AD-A130453) Avail: NTIS HC A04/MF A01 CSCL 12/1

Multipartitional extensions of Bell (unpartitional) polynomials are shown to be a natural and strong tool in the study of multivariate compound discrete distributions through their generating functions. Modifications of exponential polynomials simplify proofs in fluctuation theory, whereas asymptotic properties of such polynomials are used to establish the asymptotic normality of a wide class of combinatorial distributions, including Stirling and C-numbers. Extensions of these numbers, the non-central Stirling numbers and the multi-parameter Stirling and C-numbers are studied in conjunction with distributional, estimation and characterization problems related to compound distributions. Combinatorial and occupancy-model aspects are also discussed. Diagnostic tests in data analysis are pointed out. Author (GRA)

N84-10893# Stanford Univ., Calif. Dept. of Statistics.
FURTHER EXAMINATION OF SIMULATED PERCENTAGE POINTS
Michael A. Stephens 15 Jun. 1983 18 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A130338; SU-TR-334) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a previous report, Juritz, Juritz and Stephens (1981) discussed methods of obtaining percentage points of distributions by Monte Carlo studies, either by using one long run, or using the average of several smaller runs. The single run has certain advantages--in particular, less bias. The two methods were illustrated using Monte Carlo studies. In this follow up, the comparison is continued, using as illustrations the normal and exponential distributions, for which exact values of order statistics can easily be found. An amalgamation of the earlier report and this one is now published in Juritz, Juritz and Stephens (1983).
Author (GRA)

N84-10894# Brown Univ., Providence, R. I. Center for Dynamical Systems.
OPTIMAL CONTROL OF MARKOV PROCESSES
Wendell H. Fleming Mar. 1983 27 p refs Presented at the Intern. Congr. of Mathematicians, Warsaw, Aug. 1983
(Grants AF-AFOSR-0116-81; NSF MCS-81-21940; AF Proj. 2304)
(AD-A129296; AFOSR-83-0492TR; LCDS-83-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this article is to give an overview of some recent developments in optimal stochastic control theory. Broadly speaking, stochastic control theory deals with models of systems whose evolution is affected both by certain random influences and also by certain inputs chosen by a controller. The authors are concerned here only with state-space formulations of control problems in continuous time. Moreover, the authors consider only markovian control problems in which the state x sub t of the process being controlled is Markov provided the controller follows a Markov control policy. They mainly discuss the case of contin-

uously acting control, in which at each time t a control u sub t is applied to the system. GRA

N84-10895# Syracuse Univ., N. Y. Dept. of Mathematics.
THE HETEROSCEDASTIC METHOD: THEORY AND APPLICATIONS Final Report, 1 Oct. 1979 - 30 Sep. 1981
Edward J. Dudewicz Columbus, Ohio Ohio State Univ. Research Foundation Apr. 1983 14 p refs
(Contract N00014-78-C-0543)
(AD-A129525) Avail: NTIS HC A02/MF A01 CSCL 12/1

Statistical procedures for many problems have in the past usually, in fact almost exclusively, assumed that the random variables observed have equal variance-convariance matrices. In practice the author often finds substantially unequal variance-covariance matrices arising in such practical problems as processing signals (e.g., sonar, radio, etc.) in noise, but classically only imprecise rule-of-thumb methods, or else methods involving some loss of information, were available for these problems. Research was undertaken to develop the general theory for solving such problems and apply it to important problems. GRA

N84-10896# Stanford Univ., Calif. Dept. of Psychology.
WEIGHING EVIDENCE: THE DESIGN AND COMPARISON OF PROBABILITY
Glenn Shafer and Amos Tversky Jun. 1983 79 p refs
(Contract N00014-79-C-0077; Grant NSF MCS-80-00213; NR Proj. 197-058)
(AD-A131475) Avail: NTIS HC A05/MF A01 CSCL 05/10

The assessment of probability on the basis of evidence is viewed as a thought experiment that yields an expression of degree of belief. Theories of subjective probability are viewed as tools or languages for analyzing evidence and expressing degree of belief. This article focuses on two probability languages: the classical Bayesian language and the language of belief functions. We describe and compare the semantics (i.e., the meaning of the scale) and the syntax (i.e., the formal calculus) of these languages. We also analyze the designs of thought experiments afforded by the two languages and discuss their implications. Author (GRA)

N84-10897# Information Spectrum, Inc., Arlington, Va.
PROJECT UPGRADE EXTENDED STATISTICAL ANALYSIS Final Technical Report
George A. Kettner Jun. 1983 65 p refs
(Contract N00014-81-C-0368)
(AD-A130823; ISI-V-2693-102) Avail: NTIS HC A04/MF A01 CSCL 12/1

This study provided a statistical analysis of the Navy's Project UPGRADE, a program for administrative early discharge of first term enlistees. The study analyzed the effect of UPGRADE on the overall Navy early discharge profile for first-term enlistees, and identified enlistee characteristics and Navy-related factors which distinguished UPGRADE members from comparison groups. Author (GRA)

N84-10898# Naval Research Lab., Washington, D. C. Dept. of Operations Research.
SOME PROBABILITY MODELS RELATED TO CLASSICAL OCCUPACY WITH POSSIBLE APPLICATIONS TO TACTICAL ANALYSIS
Bruno O. Shubert Jul. 1983 46 p refs
(AD-A131056; NPS55-83-019) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this report three types of probability distributions associated with random search-type models are derived. The distributions are closely related to the classical occupancy problem. The first two types are univariate and are applicable to simple random search models such as mine hunting or one-kind mine sweeping. The thrid type is multivariate allowing for various mine ship count settings. Author (GRA)

N84-10899# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
AN ALTERNATIVE APPROACH TO QUANTUM STATISTICS
S. Teilter (NRL) and A. K. Jajopal 21 Jun. 1983 15 p refs Submitted for publication
(Contract N00014-82-K-0477)
(AD-A131525) Avail: NTIS HC A02/MF A01 CSCL 20/10

The Fermi-Dirac, Bose-Einstein and, for completeness the Maxwell-Boltzmann, distributions are obtained respectively from considerations of binomial, negative binomial, and Poisson assemblies. The method used has the simplicity of the traditional derivations that are based on combinatorial considerations but involves neither the identification of most probable values with means values nor the invocation of large numbers of particles involved in the use of Stirling's approximation for factorials. The method thereby also relaxes the requirement for large numbers of particles needed in other available derivations that also use mean values, namely, the Darwin-Fowler method of steepest descents and the Khinchin method that employs limit theorems of the theory of probability. GRA

N84-10900# Oak Ridge National Lab., Tenn. Computer Sciences.
OPTIMIZATION OF NEXT-EVENT ESTIMATION PROBABILITY IN MONTE CARLO SHIELDING CALCULATIONS
T. J. Hoffman and J. S. Tank 1983 7 p refs Presented at the 6th Intern. Conf. on Radiation Shielding, Tokyo, 16 May 1983
(Contract W-7405-eng-26)
(DE83-012643; CONF-830538-7) Avail: NTIS HC A02/MF A01

In Monte Carlo radiation transport calculations with point detectors, the next-event estimation is employed to estimate the response to each detector from all collision sites. The computation time required for this estimation process is substantial and often exceeds the time required to generate and process particle histories in a calculation. This estimation from all collision sites is, therefore, very wasteful in Monte Carlo shielding calculations. For example, in the source region and in regions far away from the detectors, the next-event contribution of a particle is often very small and insignificant. A method for reducing this inefficiency is described. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-10901# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
SPEEDS: A NEW TECHNIQUE FOR THE ANALYSIS AND OPTIMIZATION OF QUEUEING NETWORKS
Feb. 1983 184 p refs
(Contract N00014-75-C-0648; Grant NSF ENG-78-15231)
(PB83-228951; TR-675; NSF/ECS-83003) Avail: NTIS HC A09/MF A01 CSCL 12B

The sample path perturbation extrapolation of discrete even systems (SPEEDS), a time domain-based approach which views a queueing network as a stochastic system evolving in time and which observes the sample realization of its trajectory, is discussed. This approach differs from the simulation approach to queueing systems because analysis is used to derive answers to the question: what will happen if the sample trajectory is repeated exactly except for a small perturbation at some time t. The SPEEDS approach is shown to combine the advantages of both the theoretical and the simulation approaches while minimizing their disadvantages. Experimental results validating the approach to a general queueing network with a single customer class are provided and both classical and nonclassical networks are treated. Perturbation analysis is discussed in terms of infinitesimal perturbations and analysis and experimental validation of perturbation rules are provided for finite perturbations. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-10902# British Library Lending Div., Boston Spa (England).
MAGNETIC SUSCEPTIBILITY OF Fe-B, Fe - P AND Ni - P ALLOYS
G. D. Ayushina, O. I. Ostrovskii, and V. A. Grigoryan 14 Jul. 1983 3 p refs Transl. into ENGLISH from Izv. (USSR), no. 9, 1982 p 151
(BLL-M-35126-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The Faraday method was used to measure the magnetic susceptibility of solid and molten Fe -B (o to 10.6%B), Fe - P(0 to 13.3%P) and Ni - P(o to 20 8%P) between the Curie temperature and 1600 C. The results obtained are compared with data in the literature and the variance of the findings is explained. A.R.H.

N84-10903# British Library Lending Div., Boston Spa (England).
NON-NEWTONIAN INTRINSIC VISCOSITY OF RIGID ELLIPSOID SOLUTIONS
Y. Bayec and C. Wolff 26 Jul. 1983 19 p Transl. into ENGLISH from Rheol. Acta (West Germany)
(BLL-WH-570-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The values of the viscosity factor nu of prolate and oblate ellipsoids are calculated for axial ratio p (or 1/p) between 2 and 600 and up to values of the parameter a = G/D shear rate and p, between the rotary diffusion constant D and the shape of the non-newtonian viscosity curve and a test of rigidity for the ellipsoids are given. These results were applied to poly-benzyl-L-glutamate, (PBLG) and show that PBLG, in helical configuration, undergoes transitions at critical molecular weights. The rigidity test shows that PBLG is always rigid in metacresol but not in dichloroethane. M.G.

N84-10904# Weston Observatory, Mass.
INVESTIGATION OF MAGNETIC FIELD MEASUREMENTS Final Report, 1 Oct. 1979 - 30 Sep. 1982
John F. Devane Hanscom AFB, Mass. AFGL 28 Feb. 1983 17 p refs
(Contract F19628-80-C-0005; AF Proj. 7601)
(AD-A130422; AFGL-TR-83-0058) Avail: NTIS HC A02/MF A01 CSCL 20/3

This contract had as its basic requirement the maintenance of the Air Force Magnetometer Network and the additional task of upgrading and calibration of the instrumentation employed in the Network. To aid the calibration of instrumentation, the contract also required the recording of magnetic field components at Weston Observatory and the maintenance of a test facility. A firm program of upgrading was well underway when, in April 1981, the Sudbury station of the Network was destroyed by fire. The focus of the work then became the establishment of a Network Station on the grounds of Weston Observatory and the construction and purchase of equipment to replace that lost in the fire. During the last fifteen months of the contract the work effort concentrated on the construction of two data collection platforms. Support was also provided to AFGL to process the fluxgate magnetometer archive tapes in order to make the data available to the scientific community by deposition in WDC-A, Boulder, CO. GRA

N84-10905# Texas Technological Univ., Lubbock. Lab. for Plasma and Switching.
COORDINATED RESEARCH PROGRAM IN PULSED POWER PHYSICS Annual Report, 1 Oct. 1981 - 30 Sep. 1982
M. Kristiansen, M. Hagler, J. Craig, L. Hatfield, G. Schaefer, K. Schoenbach, and F. Williams 1 Dec. 1982 283 p refs
(Contract F49620-79-C-0191; AF Proj. 2301)
(AD-A129554; AFOSR-83-0503TR; AR-3) Avail: NTIS HC A13/MF A01 CSCL 20/3

Eight program elements related to pulsed power research are described. These program elements form a multi-disciplinary, coordinated program whose main emphasis is to gain improved understanding of high power, repetitive closing and opening switches. The main emphasis is concerned with triggering of discharges in gas filled spark gaps and the associated electrode erosion and insulator damage. Considerable efforts are also being made to understand the limitations and fundamental discharge phenomena in fast opening switches for inductive energy storage. A novel electromechanical pulse generator which promises to deliver fast, repetitive pulses to a load is also being investigated. Author (GRA)

N84-10906# Pittsburgh Univ., Pa. Dept. of Chemistry.
STUDY OF MATERIALS HAVING SIGNIFICANCE FOR HIGH ENERGY MAGNET PRODUCTION AND FOR HYDROGEN STORAGE Final Report, 1 Jul. 1980 - 30 Jun. 1983
W. E. Wallace 15 Jul. 1983 14 p refs
(Contract DAAG29-80-K-0036)
(AD-A130900; ARO-17165.42-MS) Avail: NTIS HC A02/MF A01 CSCL 20/3

The work carried out between July 1, 1980 and June 30, 1983 is described in detail in 6 review articles and 38 articles providing accounts of original work. The distribution of published papers is as follows: Journal of Magnetism and Magnetic Materials 10, Solid State Communications - 6, Journal of the Less-Common Metals - 5, Journal of Applied Physics - 4, Journal of Solid State Chemistry - 4, Journal of Physical Chemistry -3, Journal of Physics and Chemistry of Solids -1, and chapters in various books - 11. A considerable part of the work has been concerned with the Zr Effect, the benefication of permanent magnet properties of rare earth-cobalt systems by doping with small amounts (1 wt%) of Zr (or Ti or Hf). It has been found that Zr replaces Co in R2Co17 systems, and this results in a sharp increase in magnetocrystalline anisotropy. This is responsible for part (but undoubtedly not all) of the Zr effect. Systems such as ErPrC017 are found to exhibit enhanced magnetocrystalline anisotropy, compared to Er2C017 or Pr2C017, since Er and Pr are observed to preferentially occupy the 2b and 2d sites, respectively. In these sites each has uniaxial anisotropy, as predicted from single ion anisotropy theory. Preferential site occupancy occurs because of the size difference between Er and Pr. Similar effects are observed in RPrC017 systems with R = Tm or Yb. GRA

N84-10907# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ANALYTICAL EVALUATION OF THE POTENTIAL DUE TO A UNIFORMLY CHARGED PLANAR TRIANGULAR REGION
Joseph R. Mautz, Ecument Arvas, and Roger F. Harrington Apr. 1983 49 p refs
(Contract N00014-76-C-0225)
(AD-A130810; SYRU/DECE/TR-83-7; TR-20) Avail: NTIS HC A03/MF A01 CSCL 12/1

The electrostatic potential due to a planar triangular patch of surface charge of unit charge density in free space is proportional to the surface integral over the patch of the reciprocal of the distance to the observation point. Several closed form expressions for this integral are available in the literature. The present report gives a detailed derivation of one of these expressions. Author (GRA)

N84-10908# General Electric Co., Binghamton, N.Y. Armament and Electrical Systems Dept.
PERMANENT MAGNET GENERATOR ROTOR CONTAINMENT

STUDY Final Report, Sep. 1980 - Nov. 1982
E. U. A. Siddigui Wright-Patterson AFB, Ohio AFWAL May 1983 148 p
(Contract F33615-80-C-2032; AF Proj. 3145)
(AD-A131252; AFWAL-TR-83-2031) Avail: NTIS HC A07/MF A01 CSCL 20/3

The design, development and testing of an advanced containment structure for high speed permanent magnet machines is presented. The primary intent of the program was to achieve a reduction in system weight, volume and cost through the use of an improved containment design. A secondary objective was to minimize rotor pole face losses and, thus improve generator efficiency. GRA

N84-10909# Massachusetts Inst. of Tech., Cambridge.
TECHNICAL ANALYSES AND RELATED PLANNING ASSISTANCE IN SUPPORTING OF DOE'S SUPERCONDUCTING MAGNETIC ENERGY STORAGE PROGRAM Final Report
M. Hoenig and P. Graneau 15 Mar. 1983 39 p refs
(Contract DE-AC02-80ET-26502)
(DE83-012005; DOE/ER-26502/1) Avail: NTIS HC A03/MF A01

Various problems are assessed that will be encountered in the design of large superconducting magnetic energy storage (SMES) systems. Then a scoping study on design requirements for a 10,000 MWh SMES system is reported. Basic system requirements are defined, followed by a comparison of two basic coil concepts. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-10910*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
LIGHT AIRCRAFT SOUND TRANSMISSION STUDY
Mahabir Atwal, John David, Karen Heitman, and Malcolm J. Crocker Aug. 1983 26 p refs
(Contract NAG1-58)
(NASA-CR-174540; NAS 1.26:174540) Avail: NTIS HC A03/MF A01 CSCL 20A

The revived interest in the design of propeller driven aircraft is based on increasing fuel prices as well as on the need for bigger short haul and commuter aircraft. A major problem encountered with propeller driven aircraft is propeller and exhaust noise that is transmitted through the fuselage sidewall structure. Part of the work which was conducted during the period April 1 to August 31, 1983, on the studies of sound transmission through light aircraft walls is presented. Author

N84-10911*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FIELD-INCIDENCE TRANSMISSION OF TREATED ORTHOTROPIC AND LAMINATED COMPOSITE PANELS
Leslie R. Koval Aug. 1983 50 p refs
(NASA-TM-85680; NAS 1.15:85680) Avail: NTIS HC A03/MF A01 CSCL 20A

In an effort to improve understanding of the phenomenon of noise transmission through the sidewalls of an aircraft fuselage, an analytical model was developed for the field incidence transmission loss of an orthotropic or laminated composite infinite panel with layers of various noise insulation treatments. The model allows for four types of treatments, impervious limp septa, orthotropic trim panels, porous blankets, and air spaces, while it also takes into account the effects of forward speed. Agreement between the model and transmission loss data for treated panels is seen to be fairly good overall. In comparison with transmission loss data for untreated composite panels, excellent agreement occurred. Author

N84-10912*# United Technologies Research Center, East Hartford, Conn.
ROTOR-VORTEX INTERACTION NOISE Final Report
Robert H. Schlinker and Roy K. Amiet Washington NASA Oct. 1983 130 p refs
(Contract NAS1-16392)
(NASA-CR-3744; NAS 1.26:3744) Avail: NTIS HC A07/MF A01 CSCL 20A

A theoretical and experimental study was conducted to develop a validated first principles analysis for predicting noise generated by helicopter main-rotor shed vortices interacting with the tail rotor. The generalized prediction procedure requires a knowledge of the incident vortex velocity field, rotor geometry, and rotor operating conditions. The analysis includes compressibility effects, chordwise and spanwise noncompactness, and treats oblique intersections with the blade planform. Assessment of the theory involved conducting a model rotor experiment which isolated the blade-vortex interaction noise from other rotor noise mechanisms. An isolated tip vortex, generated by an upstream semispan airfoil, was convected into the model tail rotor. Acoustic spectra, pressure signatures, and directivity were measured. Since assessment of the acoustic prediction required a knowledge of the vortex properties, blade-vortex intersection angle, intersection station, vortex stength, and vortex core radius were documented. Ingestion of the vortex by the rotor was experimentally observed to generate harmonic noise and impulsive waveforms. Author

N84-10913*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATION OF EFFECTS OF MICROPHONE POSITION AND ORIENTATION ON NEAR-GROUND NOISE MEASUREMENTS
William L. Willshire, Jr. and Paul A. Nystrom Apr. 1982 45 p refs
(NASA-TP-2004; L-15097; NAS 1.60:2004) Avail: NTIS HC A03/MF A01 CSCL 20A

Three ground level microphone mounting techniques (flush mounting, inverting the microphone over a plate, and lying the microphone on a plate) were compared over a frequency range from 315 Hz to 20 kHz and over a wide range of incidence angles in the Langley Jet-Noise Laboratory anechoic room. The flush mounted microphone, when compared with a free field microphone, exhibited approximate pressure doubling up to a frequency of 10 kHz. At frequencies less than 4 kHz, the inverted and lying microphones were in good agreement with the flush mounted microphone, and their 1/3-octave-band response spectra were fairly insensitive to the position of the microphone. At higher frequencies, the geometry of the microphone and its mounting became important. The inverted microphone 0.5 times the diameter above the plate gave the flattest response compared with the flush mounted microphone. Nondimensional analysis of the inverted and lying results showed that for Kappa H cos theta < 0.7 the response of the microphones approached that of the flush mounted microphone. Author

N84-10914# Naval Underwater Systems Center, New London, Conn. Submarine Sonar Dept.
OPTIMUM MULTISENSOR, MULTITARGET LOCALIZATION AND TRACKING Ph.D. Thesis - Connecticut Univ.
Lawrence C. Ng 7 Jun. 1983 350 p refs
(AD-A129805; NUSC-TR-6931) Avail: NTIS HC A15/MF A01 CSCL 12/1

This study provides a fundamental examination of the optimum signal processor design for time delay estimation under the assumption of a multisensor, multitarget environment. Using an MLE procedure, an optimum multisensor, multitarget time delay estimator is derived. The resulting signal processor is reduced to its simplest form for system realization. In addition, this study derives the appropriate performance bound for the resulting estimator. Comparisons between optimum and suboptimum realizations are also discussed. The optimum multisensors, multitarget time delay estimator is then refined to include the moving target environment. Finally, the variable time delay estimator is applied to the problem of variable localization parameter estimation and tracking. The organization of this report is as follows: Chapter

2 discusses and formulates the multisensor, multitarget time delay estimation problem. Chapter 3 derives the optimum time delay estimator and an appropriate performance bound. In addition, the extension of time delay estimation to localization parameter estimation and power spectral estimation is considered. Chapter 4 provides some discussion on suboptimum processor realization. Chapter 5 discusses alternate approaches for improved multitarget parameter resolution. Chapter 6 extends the optimum time delay processor to include variable time delays. Chapter 7 examines the problem of optimum variable localization parameter estimation and tracking. Finally, Chapter 8 presents the summary, conclusions, and recommendations of the study. GRA

N84-10915# Naval Research Lab., Washington, D. C.
A REVIEW OF RESEARCH IN CHEMICAL-ACOUSTIC COUPLING
Elaine S. Oran and John H. Gardner 8 Jul. 1983 18 p refs
(AD-A129896; NRL-MR-5121) Avail: NTIS HC A02/MF A01 CSCL 20/1

In this review we have summarized previous research in chemical-acoustic interactions and extracted from it those elements which may be most important to reactive flows of exothermic materials. Author (GRA)

N84-10916# Georgetown Univ., Washington, D.C. Dept. of Physics.
ULTRASONIC REFLECTION FROM SOLID HALFSPACES AND FROM SOLID PLATES Technical Report, 1 Aug. 1982 - 1 Jun. 1983
Walter G. Mayer, T. D. K. Ngoc, D. McLennan, O. J. Leroy, and J. M. Claeys 17 Jun. 1983 24 p refs
(Contract N00014-78-C-0584)
(AD-A129886; TR-6) Avail: NTIS HC A02/MF A01 CSCL 20/1

Four aspects of ultrasonic reflectivity are discussed; reflection coefficient reducibility from thin plate to halfspace; reflection of bounded beam; inhomogeneities of reflector; and multifrequency beam reflection phenomena. Author (GRA)

N84-10917# La Jolla Inst., Calif. Center for the Study of Nonlinear Dynamics.
SCATTERING OF WAVES BY IRREGULARITIES IN PERIODIC DISCRETE LATTICE SPACES. PART 2: CALCULATIONS Interim Report
Neil Pomphrey, Elliott W. Montroll, and Bruce J. West 1983 40 p refs
(Contract F49620-81-K-0017; AF Proj. 2306)
(AD-A130665; AFOSR-83-0633TR; LJI-R-83-229) Avail: NTIS HC A03/MF A01 CSCL 12/1

The general formalism for the exact scattering of a scalar wave from N scatterers on a discrete lattice is reviewed. The interpretation of the exact solution in terms of approximation techniques is given and the expression for the scattering cross sections is derived. The expressions necessary for the calculation of the lattice Greens function are discussed and a number of asymmetric scattering configurations are considered. Author (GRA)

N84-10918# Royal Australian Navy Research Lab., Edgecliff.
AFTERNOON EFFECT STUDIES, PART 1
J. Warren Hill Apr. 1983 73 p refs
(AD-A130926; RANRL-TN(EXT)-3/82-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 20/1

Afternoon effect is a type of sonar performance loss encountered during the afternoons and evenings of calm sunny days. It is caused by a temperature rise near the top of the otherwise isothermal mixed layer, increasing the sound speed there and so refracting the sound rays downwards, away from the sonar target. The temperature rise profile is governed by wind speed, solar heating and other meteorological factors, so that afternoon effect prediction should become an extension of meteorological forecasting. However there is at present no established method for computing the temperature profile from the meteorological information. A mixed-layer model is presented which appears to meet this need, subject to further testing. The influences of some key environmental factors are explored. An example of afternoon effect prediction is given, and the next steps towards a routine prediction facility are indicated. Author (GRA)

N84-10919# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTED SENSOR NETWORK Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1982
Richard T. Lacoss 30 Sep. 1983 53 p refs
(Contract F19628-80-C-0002; ARPA Order 3345; AF Proj. 3D30; AF Proj. 3T10)
(AD-A131245; ESD-TR-83-020) Avail: NTIS HC A04/MF A01 CSCL 17/1

The Distributed Sensor Networks (DSN) program is aimed at developing and extending target surveillance and tracking technology in systems that employ multiple spatially distributed sensors and processing resources. Such a system would be comprised of sensors, data bases, and processors distributed throughout an area and interconnected by an appropriate digital-data communication system. Surveillance and tracking of low-flying aircraft have been selected to develop and evaluate DSN concepts in the light of a specific system problem. ADSN test bed that will make use of multiple small acoustic arrays as sensors for low-flying aircraft surveillance is being developed and will be used to test and demonstrate DSN techniques and technology. GRA

N84-10920# Argonne National Lab., Ill. Components Technology Div.
VISCOUS EFFECT ON ACOUSTIC SCATTERING BY ELASTIC SOLID CYLINDERS AND SPHERES
W. H. Lin and A. C. Raptis Apr. 1983 52 p refs
(Contract W-31-109-eng-38)
(DE83-014271; ANSL/FE-83-5) Avail: NTIS HC A04/MF A01

Analytic studies and numerical results of the scattering of plane sound waves from an elastic circular cylinder and from an elastic sphere in a viscous fluid were described. The elastic properties of the cylinder and the sphere and the viscosity of the surrounding fluid are taken into account in the solution of the acoustic scattering problems. The associated acoustic quantities, such as the acoustic scattering patterns, the acoustic radiation forces, and the acoustic attenuation, are first derived in closed forms and then evaluated numerically for a given set of material properties. Numerical results show that increasing fluid viscosity tends to increase the directionality of the angular distribution of the scattering patterns, especially in the forward direction. The acoustic radiation force on the cylinder or on the sphere is in the direction of the incident wave and increases as the viscosity of the fluid increases. DOE

N84-10921# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ACOUSTIC RANGING TECHNIQUE WITH APPLICATION TO ASSESSMENT OF LOW-FREQUENCY ACOUSTIC NOISE OF WIND TURBINES
Robert Hemphill May 1983 13 p refs Presented at the Wind/Solar Energy Conf., Kansas City, Mo., 25-26 Apr. 1983
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-009106; SERI/TP-215-1954; CONF-830432-3) Avail: NTIS HC A02/MF A01

Impulsive low frequency noise from wind turbines can cause annoyance particularly when a residential structure is involved. Such noise is typically generated in some spatially restricted region of a turbine rotor swept area. Low frequency impulsive noise of the MOD-1 turbine was generated when the rotor blades passed downwind of the tower legs encountering the complex unsteady flows there. An acoustic ranging technique that aids assessment of the degree of concentration of acoustic generation within the turbine swept area and which determines the time average spatial source region of such concentration is described. Practical applications and limitations of the process are discussed. DOE

N84-10922# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
HELICOPTER NOISE SURVEY CONDUCTED AT NORWOOD, MASSACHUSETTS ON APRIL 27, 1983

Steven R. Albersheim Jun. 1983 30 p
(AD-A131053; FAA/EE-83-6) Avail: NTIS HC A03/MF A01 CSCL 20/1

The FAA conducted a noise measurement survey of helicopter operations at Norwood, Massachusetts on April 27, 1983. The purpose was to gather needed information for defining noise problems with in-service helicopter operations at a general aviation airport in a suburban area. Noise level data were sampled over a period of approximately 8 hours. The data collected reflect noise levels at two different residential sites from all local source of noise during that particular sampling period. These data from helicopter target of opportunity are termed survey data as opposed to controlled test data in order to reflect the limited control factors which contribute to the variability of the measured noise.
Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-10923*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MATRIX EFFECTS IN ION-INDUCED EMISSION AS OBSERVED IN Ne COLLISIONS WITH Cu-Mg AND Cu-Al ALLOYS
John Ferrante and Stephen V. Pepper Sep. 1983 9 p refs
(NASA-TM-83961; E-1532; NAS 1.15:83961) Avail: NTIS HC A02/MF A01 CSCL 20H

Ion induced Auger electron emission is used to study the surfaces of Al, Mg, Cu - 10 at. % Al, Cu - 19.6 at. % Al, and Cu - 7.4 at. % Mg. A neon (Ne) ion beam whose energy is varied from 0.5 to 3 keV is directed at the surface. Excitation of the lighter Ne occurs by the promotion mechanism of Barat and Lichten in assymetric collisions with Al or Mg atoms. Two principal Auger peaks are observed in the Ne spectrum: one at 22 eV and one at 25 eV. Strong matrix effects are observed in the alloys as a function of energy in which the population of the second peak is greatly enhanced relative to the first over the pure materials. For the pure material over this energy range this ratio is < 1.0. For the alloys it can rise to the electronic structure of alloys and to other surface tools such as secondary ion mass spectroscopy.
Author

N84-10924# Oregon Univ., Eugene. Dept. of Physics.
RELATIVISTIC CALCULATIONS AND MEASUREMENTS OF ENERGIES, AUGER RATES AND LIFETIMES Annual Scientific Report, 1 Dec. 1981 - 30 Nov. 1982
B. Crasemann and M. H. Chen Dec. 1982 18 p refs
(Grant AF-AFOSR-0026-79; AF Proj. 2301)
(AD-A130094; AFOSR-83-0550TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Substantial progress has been made with ab initio relativistic computations of atomic inner-shell energy levels and properties of few-electron ions. A relativistic calculation fo inner-shell ionization by slow protons has been very successful. Threshold-excitation experiments with hard synchrotron radiation have been extended to explore post-collision interaction and the resonant Auger Raman effect which link the atomic excitation and deexcitation processes.
GRA

N84-10925# Tel-Aviv Univ. (Israel). School of Engineering.
A STUDY OF THE ANGULAR RADIATION OF SMITH-PURCELL RADIATION Final Scientific Report, Nov. 1980 - Oct. 1981
A. Gover, P. Dvorkis, and U. Elisha 20 May 1983 26 p refs
(Grant AF-AFOSR-0060-81; AF Proj. 2301)
(AD-A130095; AFOSR-83-0566TR) Avail: NTIS HC A03/MF A01 CSCL 20/7

The power radiation pattern of the Smith-Purcell radiation was measured at various latitudes and azimuth angles relative to the electron beam. The experimental data is used to evaluate the various models and physical mechanisms previously suggested to describe the Smith-Purcell radiation. Good agreement was observed between the experimental data and theoretical curves derived from Van-Den-Berg's analysis. The radiation mechanism proposed by Salisbury was analyzed and shown to be too small to account for the measured radiation. The experiment and Van-Den-Berg's theory predict stronger emission at azimuthal angles off the plane perpendicular to the gratings. This observation leads to conclusions regarding the design of optical cavities for Smith-Purcell free electron lasers and Orotron millimeter wavelength radiation tube devices.
Author (GRA)

N84-10926# Washington Univ., Seattle.
AERODYNAMICS OF E-BEAM SUSTAINED DISCHARGES IN FLOW Final Scientific Report, 15 Jul. 1982 - 14 Feb. 1983
Walter H. Christiansen 14 Apr. 1983 4 p refs
(Grant AF-AFOSR-0289-82; AF Proj. 2301)
(AD-A130100; AFOSR-83-0572TR) Avail: NTIS HC A02/MF A01 CSCL 20/7

The fundamental mechanism of the interaction of electric discharge of the glow type and the fluid mechanics normally found in electric discharge lasers has been studied.
Author (GRA)

N84-10927# Duke Univ., Durham, N. C. Lab. for Chemistry.
AN APPROACH TO MOLECULAR COMPOSITES Final Report, 1 Apr. 1979 - 31 Dec. 1982
William R. Krigbaum and Jack Preston 31 Dec. 1982 9 p refs
(Grant AF-AFOSR-0080-79; AF Proj. 2303)
(AD-A130192; AFOSR-83-0578TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

One objective was to demonstrate that a nematogen can be made to exhibit a cholesteric phase by the incorporation of chiral centers into the polymer chain. The Yamazaki reaction was used to introduce 3 mole percent of chiral L-valine into poly(p-benzamide). This was shown to form a lyotropic cholesteric phase by circular dichroism and the induced circular dichroism of an achiral dye. A disadvantage of the use of lyotropic mesomorphism was that few solvents were available and the production costs were high. The early lattice model treatment of Flory indicated that a highly extended molecular conformation was essential to the formation of this type of mesophase. It has been demonstrated that the melting point depression of a crystalline polymer by this type of mesophase will be quite small unless the polymer-solvent interaction is very favorable. This implies that the polymer solubility will only be sufficient for the formation of a lyotropic mesaphase for those few polymer-solvent systems in which the interactions were very favorable. It was found that the Yamazaki phosphorylation reaction could be made to yield aromatic polyamides of higher inherent viscosity by using a monomer having pre-formed amide linkages. It is believed that this occurs due to reduction in the byproducts of the polymerization.
GRA

N84-10928# Rochester Univ., N. Y. Dept. of Chemistry.
RESONANCE FLUORESCENCE OF A TWO-LEVEL ATOM NEAR A METAL SURFACE
Xi-yi Huang, Jui-teng Lin, and Thomas F. George Jun. 1983 30 p refs
(Contract N00014-80-C-0472)
(AD-A130277; UROCHESTER/DC/83/TR-36) Avail: NTIS HC A03/MF A01 CSCL 07/4

A derivation of surface-dressed optical Bloch equations, involving a treatment of surface-reflected photons and a surface plasmon resonance, is presented for a collision-damped two-level atom near or adsorbed on a metal surface. Effects of the laser bandwidth are included by means of a phase-diffusion model for the driving field. In the weak-field or large detuning limit, the population inversion and resonance fluorescence spectrum are obtained analytically. These quantities along with the surface-induced phase-decay constant of the adatom show strong oscillatory behavior as a function of the adatom-surface distance.
GRA

N84-10929# California Univ., Santa Barbara. Quantum Inst.
RADIATION AND LASER POTENTIAL OF HOMO AND HETERONUCLEAR RARE-GAS DIATOMIC MOLECULES Final Report

William Walker and Yoshio Tanaka Dec. 1982 45 p refs
(Contract F49620-77-C-0010; Grant AF-AFOSR-3137-77; AF Proj. 2303)
(AD-A130093; AFOSR-83-0559TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

High resolution emission spectra of the rare-gas dimers Ne2, Ar2, and Kr2 were studied in the vacuum ultraviolet region 500 - 1500 Angstroms. Four band systems previously observed in all three dimers were studied in detail and classified in terms of the transition involved. Molecular constants and details of the dimer potential curves were determined. GRA

N84-10930# Rice Univ., Houston, Tex. Dept. of Physics.
THE MEASUREMENT OF THE DIFFUSIVE MOTION OF PROTONS IN BIOLOGICAL SYSTEMS Final Report, 1 Jun. 1979 - 15 Apr. 1983
Harold E. Rorschach, Jr. 2 Jun. 1983 13 p
(Contract N00014-79-C-0492)
(AD-A129276; Rept-F1) Avail: NTIS HC A02/MF A01 CSCL 20/8

The method of quasi-elastic neutron scattering was used to study the properties of water associated with macromolecular systems. We determined the diffusion parameters for pure water, agarose gel(4 gm h20/gm dry solids). The scattering has been interpreted with a scattering law derived from a jump-diffusion model for the translational motion and a Brownian diffusion model for the rotational motion. Results were obtained for the neutron line width as a function of the momentum change of the scattered neutron, hQ. We found that the diffusive motion for the water in the agarose gel is restricted by its association with the polymer molecules, the diffusion coefficient being reduced from that of pure water by about 20%. The properties of the water in the Artemia cysts differ greatly from those of pure water. The translational diffusion coefficient is reduced by a factor of about 4 and the rotational diffusion coefficient by about 13. These changes are an intrinsic property of the cyst water produced by its association with the bio-polymers. GRA

N84-10931# California Univ., Los Angeles. Dept. of Chemistry.
MECHANISM SWITCHING AND TRAPPING OF TRIPLET-TRIPLET ENERGY TRANSFER IN AN ORIENTATIONALLY DISORDERED MOLECULAR SOLID Interim Technical Report
Jack R. Morgan and M. A. El-Sayed 15 Jul. 1983 43 p refs Submitted for publication
(Contract N00014-75-C-0602; NR Proj. 056-498)
(AD-A130660; TR-43) Avail: NTIS HC A03/MF A01 CSCL 20/8

The separation between the ions or molecules in disordered solids varies at random. The optical transition energy could also vary over a wide range for the different molecules or ions in the solid resulting in a large inhomogeneous line width (delta v inh). This allows energy transfer and spectral diffusion studies to be carried out between the same chemical species but at different local environments in these solids using lasers for excitation. Furthermore, when carried out at temperatures at which kT delta v inh, energy transfer becomes unidirectional, i.e., to molecules or ions having transition energies equal or lower than the laser-excited-donors within the inhomogeneous profile. This allows studies on the dependence of the rate and mechanism of the energy transfer on the acceptor concentration (i.e., on donor-acceptor separation) to be carried out by simply changing the laser wavelength within the inhomogeneous profile. By analyzing the temporal behavior of the emission intensity of the pulsed-laser-excited set of molecules or ions (donors), the mechanism of the excitation transfer can be elucidated. These types of studies are carried out on the triplet-triplet energy transfer in a unique type of disordered solid, orientationally disordered molecular solids, e.g., 1-bromo,4-chloronaphthalen (BCN) neat solid. GRA

N84-10932# Maryland Univ., College Park. Dept. of Physics and Astronomy.
NEW METHOD IN ELEMENTARY PARTICLE DETECTION Final Report, 1 Jan. 1981 - 31 Dec. 1982
J. Weber Feb. 1983 41 p refs
(Contract F49620-81-C-0024; ARPA Order 4099)
(AD-A131238; AFOSR-83-0681TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A general theory of coherent scattering is presented. Applications for very low energy involving the neutral current interactions are considered in detail, together with results of experimental checks. Author (GRA)

N84-10933# Oak Ridge National Lab., Tenn.
COULOMB EXPLOSION AND RECENT METHODS FOR STUDYING MOLECULAR DECOMPOSITION
Thomas A. Carlson 1982 15 p refs Presented at the Desorption Induced by Electronic Transitions Conf., Williamsburg, Va., 12 May 1982
(Contract W-7405-eng-26)
(DE83-012348; CONF-8205110-4) Avail: NTIS HC A02/MF A01

An account is given of the nature of a molecular Coulomb explosion, based on experimental studies of fragment ion spectra and their recoil energies resulting from photoionization of core shell electrons in gaseous molecules. The extent of multiple ionization in a vacancy cascade is discussed, and a simple model is used to predict the amount of kinetic energy possessed by the fragment ions. Data on both diatomic molecules containing light atoms and more complex molecules containing heavy atoms are reviewed. A broad outline is presented of studies that are carried out on molecular decomposition through the use of laser and synchrotron radiation. Some indications are given of how information on the decomposition of free molecules is applied to the desorption of molecules adsorbed on surfaces. DOE

N84-10934# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
INTENSE ANTIPROTON SOURCE FOR A 20 TeV COLLIDER
G. R. Lambertson and C. W. Leemann Apr. 1983 5 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00098)
(DE83-012878; LBL-15127; CONF-830311-162) Avail: NTIS HC A02/MF A01

The feasibility of production collecting and cooling anti p's at a rate > 3 10 (8)s(+1) is demonstrated. This implies a filling time of approx. 12 hours to reach a luminosity of approx. = 10 (32) cm(+2)s(+1) in the collider. DOE

N84-10935# Commissariat a l'Energie Atomique, Saclay (France).
RECENT RESULTS IN THE STUDY OF HEAVY-ION ELEASTIC SCATTERING AT LARGE ANGLES
J. Barrette and S. Kahana (Brookhaven Natl. Lab., Upton, N.Y.) 1983 15 p refs Presented at the 21st Intern. Winter Meeting on Nucl. Phys., Bormio, Italy, 24 Jan. 1983
(Contract DE-AC02-76CH-00016)
(DE83-012214; BNL-32854; CONF-830117-4) Avail: NTIS HC A02/MF A01

The observation, a few years ago, of unexpected large cross sections at backward angles in the elastic scattering of mass asymmetric heavy ion systems gave hope that something new and more precise on the properties of the average ion-ion potential could be learned. The subsequent observation of broad regular structures in the elastic and inelastic excitation functions near theta/sub cm/ = 1800 were also very promising. Numerous models were proposed to explain some or all the observed features. These models divided mainly in two groups. Some try to modify directly the average optical potential whereas others associate the observed cross sections to a modification of specific partial waves outside the scope of the optical potential. This separation in two groups is not always clear since as demonstrated adding a Regge pole to a strongly absorbing potential is under some conditions perfectly equivalent to changing the shape of this potential. Similarly the resonances added to an S matrix is understood as the manifestation of the potential resonances of a completely different optical potential. DOE

N84-10936# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
COHERENT ANTI-STOKES RAMAN SCATTERING (CARS) DETECTION OR HOT ATOM REACTION PRODUCT INTERNAL ENERGY DISTRIBUTIONS
Charles R. Quick, Jr. and David S. Moore 1983 17 p refs Presented at the Soc. of Photo-Optical Instumentation Engrs. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-012684; LA-UR-83-1311; CONF-830425-17) Avail: NTIS HC A02/MF A01

Coherent anti-Stokes Raman spectroscopy (CARS) is being utilized to investigate the vibrational energy distributions produced by reactive and nonreactive collisions of translationally hot atoms with simple molecules. Translationally hot H atoms are produced by ArF laser photolysis of HBr. Using CARS in a state specific and time resolved manner, rotational excitation of HBr (v = J), vibrational excitation of HBr and H2, + Br, and Br atom production by photolysis of HBr were monitored. DOE

N84-10937# Los Alamos Scientific Lab., N. Mex.
EFFECTS OF VANE-TIP GEOMETRY ON THE ELECTRIC FIELDS IN RADIO-FREQUENCY QUADRUPOLE LINACS
K. R. Crandall Apr. 1983 38 p refs
(Contract W-7405-eng-36)
(DE83-013214; LA-9695-MS) Avail: NTIS HC A03/MF A01

Five types of vane-tip geometries for radio-frequency quadrupole linacs are described. Tables show the peak surface field and the eight lowest order multipole coefficients as a function of cell length and modulation parameter. The method used to obtain the data in the tables is discussed. DOE

N84-10938# Stanford Linear Accelerator Center, Calif.
DAMPING RING rf SYSTEM FOR SIC
M. A. Allen, H. D. Schwarz, and P. B. Wilson 1983 4 p refs Presented at Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-011853; SLAC-Pub-3084; CONF-830311-157) Avail: NTIS HC A02/MF A01

The linear collider project at SLAC contains two damping rings to reduce the emittance of short electron or positron bunches which contain 5 x 10(1)0 particles per bunch. Two of these bunches are stored at a time and then extracted for acceleration in the collider. The RF system is subject to strong transients in beam loading. A computer model is used to optimize capture while minimizing RF power. The introduction of phase jump in the RF drive at injection time together with offsets in the tuning loops of the RF cavities when no beam is stored allows optimum performance under heavy beam load conditions. The RF system (800 kV at 714 MHz) for the electron damping ring has been built, tested and installed, and is being tested with beam. DOE

N84-10939# Argonne National Lab., Ill.
HIGH CHARGE PICOSECOND PULSES WITH A DOUBLE GAP SUBHARMONIC BUNCHER
G. Mavrogenes, W. Gallagher, T. Kohe, and D. Ficht 1983 4 p refs Presented at Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract W-31-109-eng-38)
(DE83-011743; CONF-830311-147) Avail: NTIS HC A02/MF A01

A new improved bunching system was designed in 1976 and installed in 1981 in the Argonne Electron Linac to replace the one installed in 1972. In the new bunching system, a spiral loaded double gap 12th subharmonic buncher is replacing the previous single gap 6th subharmonic buncher and a one wavelength fundamental frequency traveling wave prebuncher has replaced the previous two wavelength prebuncher. Individual pulses of a picosecond (25 to 36) duration and up to 40 eta Coulomb in charge, with (RADICAL)E/E < + or - 0.5% at FWHM over the energy range of 4 to 22 MeV, and a repetition rate from one to 1000 p psec are available to the experimenter on a routine basis. The design and the microwave properties of the cavity are discussed along with the general design of the injector and the results achieved. DOE

N84-10940# California Univ., Berkeley. Lawrence Berkeley Lab.
ADVANCED LIGHT SOURCE
R. C. Sah Mar. 1983 7 p refs Presented at Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC03-76SF-00098)
(DE83-012894; LBL-15160; CONF-830311-165) Avail: NTIS HC A02/MF A01

The Advanced Light Source (ALS) is a new synchrotron radiation source which was proposed by Lawrence Berkeley Laboratory. The ALS will be a key component in a major new research facility, the National Center for Advanced Materials. The ALS will consist of an electron linear accelerator, a booster synchrotron, a 1.3-GeV electron storage ring, and a number of photon beam lines. Most of all photon beam lines will originate from wiggler and undulator magnets placed in the 12 long straight sections of the ALS. A very low electron beam emittance will provide photon beams of unsurpassed spectral brilliance from specially-designed undulators, and a high radiofrequency will produce very short pulse lengths. DOE

N84-10941# Los Alamos Scientific Lab., N. Mex.
NEW PROGRAM FOR THE LEAST-SQUARES CALCULATION OF ATOMIC ENERGY LEVELS
B. A. Palmer and R. Engleman, Jr. May 1983 34 p
(Contract W-7405-eng-36)
(DE83-014076; LA-9710) Avail: NTIS HC A03/MF A01

Calculation of energy levels from measured trahsitions is important in atomic spectroscopic research. We present an improved least squares program for such a calculation, a program that transfers easily to any modern computer using FORTRAN and that runs on minicomputers as well as large modern computers. How to use this program is shown in detail. DOE

N84-10942# Stanford Linear Accelerator Center, Calif.
APPLICATIONS OF VACUUM TECHNOLOGY TO NOVEL ACCELERATOR PROBLEMS
Edward L. Garwin Jan. 1983 5 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-012710; SLAC-PUB-3033; CONF-830311-144) Avail: NTIS HC A02/MF A01

Vacuum requirements for electron storage rings are most demanding to fullfill, due to the presence of gas desorption caused by large quantities of synchrotron radiation, the very limited area accessible for pumping ports, the need for 10(+9) torr pressures in the ring, and for pressure a decade lower in the interaction regions. Design features of a wide variety of distributed ion sublimation pumps (DIP) developed at SLAC to meet these requirements are discussed, as well as NEG (non-evaporable getter) pumps tested for use in the Large Electron Positron Collider at CERN. Application of DIP to much higher pressures in electron damping rings for the Stanford Linear Collider are discussed. DOE

N84-10943# Stanford Linear Accelerator Center, Calif.
IMPROVING THE PHASE STABILITY OF THE SLAC RF DRIVE-LINE NETWORK FOR SLC OPERATION
J. N. Weaver and H. A. Hogg 1983 3 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC03-76SF-00515)
(DE83-012714; SLAC-PUB-3060; CONF-830311-146) Avail: NTIS HC A02/MF A01

Successful operation of the Stanford Linear Collider (SLC) will require greater phase stability from the two mile long RF drive network than previous linac operation did. Four proposed modifications of the present system that should help achieve the general objective to reduce all long term temperature and atmospheric pressure induced phase variations to less than 200 at 2856 MHz are discussed. Then the phase/amplitude detector subsystems,

which controls the network output phases relative to a beam reference, will operate within its most accurate ranges. DOE

N84-10944# Fermi National Accelerator Lab., Batavia, Ill.
THE EFFECTS OF BEAM-BEAM COLLISIONS ON STORAGE-RING PEFORMANCE: A PEDAGOGICAL REVIEW
Jonathan F. Schonfeld Jan. 1983 68 p refs Presented at the 1982 Summer School on High-Energy Particle Accelerators, SLAC, Stanford, Calif. 2-13 Aug. 1982
(Contract DE-AC02-76CH-03000)
(DE83-012773; FERMILAB-Conf-83/17-THY; CONF-820987-4) Avail: NTIS HC A04/MF A01

A survey of the experimental and theoretical literature on colliding beam effects in both leptonic and hadronic storage rings is presented. For the most part, this literature is rather technical and, to the novice, both obscurely written and hard to locate. Although there already were several symposia on the subject, as well as a number of reviews for specialists there was up till now unified and pedagogical exposition. An attempt to fill this gap is made. The material is grouped into four major areas: observational phenomenology, computer simulation, mathematical background, and theoretical models. DOE

N84-10945# Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
ELECTRONIC-RELAXATION PROCESSES IN POLYATOMIC MOLECULES Final Report, 1 Jan. 1976 - 31 Dec. 1982
E. C. Lin Mar. 1983 14 p refs
Mar. 1983 14 p refs
(Contract DE-AC02-76ER-02192)
(DE83-008738; DOE/ER-02192/T1) Avail: NTIS HC A02/MF A01

The overall goal of the research, which was to elucidate mechanisms of electronic relaxations in polyatomic molecules, was at least partially realized in three major areas of study: (1) electronic and vibrational relaxations of aromatic molecules under collision-free conditions; (2) proximity effect in radiationless transitions in exciplexes and charge transfer complexes. A description of these accomplishments and a list of publications resulting from them are included in the report. DOE

N84-10946# Texas A&M Univ., College Station. Cyclotron Inst.
X-RAY EMISSION IN HEAVY-ION COLLISIONS Progress Report, 1 Mar. 1982 - 1 Mar. 1983
R. L. Watson Mar. 1983 105 p refs
(Contract DE-AS05-78ER-06036)
(DE83-008776; DOE/ER-06036/T1) Avail: NTIS HC A06/MF A01

A major project involving the study of electron transfer in fluorine compounds following multiple K-plus L-shell ionization by 5.5 MeV He, 22 MeV C, 48 MeV Mg, and 80 MeV Ar ions was completed. This comprehensive investigation uncovered a resonant electron transfer mechanism, provided the first quantitative estimates of electron transfer rates, and revealed the importance of fast electron transfer to n greater than or equal to 3 states in solid compounds. Considerable progress was made in delineating the effects of solid state environment on X-ray emission from highly stripped projectile ions. a surprising result was the discovery of lines associated with states involving n = 3 electrons in 48 MeV Mg projectile X-ray spectra obtained with thick carbon targets. Work was completed on a study of the alignment of foil excited H and He like states in 65 MeV sulfur ions. These measurements are being extended to Magnesium ions with the intention of searching for surface and tilted foil effects. DOE

N84-10947# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
QUASIELASTIC REACTIONS
Ole Hansen 1983 17 p refs Presented at the Nucl. Phys. with Heavy Ions Conf., Stony Brook, N.Y., 14 Apr. 1983
(Contract DE-AC02-76CH-00016)
(DE83-014616; BNL-33221; CONF-830469-9) Avail: NTIS HC A02/MF A01

A brief review is presented of the experimental and theoretical situation regarding transfer reactions and inelastic scattering. In the first category there is little (very little) precision data for heavy projectiles and consequently almost no experience with quantitative theoretical analysis. For the inelastic scattering the rather extensive data strongly supports the coupled channels models with collective formfactors. At the most back angles, at intensities about 10(+5) of Rutherford scattering, a second, compound like mechanism becomes dominant. The description of the interplay of these two opposite mechanisms provides a new challenge for our understanding. DOE

N84-10948# California Univ., Livermore. Lawrence Livermore Lab.
WHAT CAN BE LEARNED WITH FAST NEUTRONS?
F. S. Dietrich Jun. 1983 24 p refs
(Contract W-7405-eng-48)
(DE83-015783; UCID-19828) Avail: NTIS HC A02/MF A01

The DOE/NSF Nuclear Science Advisory Committee (NSAC) is preparing a new Long Range Plan for the development of nuclear science. This document, written as input to the Long Range Plan subcommittees; describes a number of ways that experiments with incident neutrons impact on outstanding problems in nuclear reactions and spectroscopy. It is argued that major extensions of present capabilities are required to carry out these experiments. DOE

N84-10949# California Univ., Livermore. Lawrence Livermore Lab.
NOVEL NEUTRALIZED-BEAM INTENSE NEUTRON SOURCE FOR FUSION TECHNOLOGY DEVELOPMENT
J. E. Osher and L. J. Perkins 8 Jul. 1983 7 p refs Presented at the 7th Symp. on Sources and Ion Assisted Technol. and the 4th Intern. Conf. on Ion and Plasma Assisted Tech., Kyoto, 12-16 Sep. 1983
(Contract W-7405-eng-48)
(DE83-014953; UCRL-89337; CONF-830920-2) Avail: NTIS HC A02/MF A01

A neutralized-beam intense neutron source (NBINS) as a relevant application of fusion technology for the type of high-current ion sources and neutral beamlines now being developed for heating and fueling of magnetic-fusion-energy confinement systems is described. This near-term application would support parallel development of highly reliable steady-state higher-voltage neutral D0 and T0 beams and provide a relatively inexpensive source of fusion neutrons for materials testing at up to reator-like wall conditions. Beam-target examples described include a 50-A mixed D-T total (ions plus neutrals) space-charge-neutralized beam at 120 keV incident on a liquid Li drive-in target, or a 50-A T0 + T() space-charge-neutralized beam incident on either a LiD or gas D2 target with calculated 14-MeV neutron yields of 2 x 10(15)/s, 7 x 10(15)s, or 1.6 x 10(16)/s, respectively. The severe local heat loading on the target surface is expected to limit the allowed beam focus and minimum target size to greater than or equal to 25 cm(2). DOE

N84-10950# Oak Ridge National Lab., Tenn.
HEAVY-ION REACTION MECHANISMS STUDIED WITH THE SPIN SPECTROMETER
M. L. Halbert 1983 34 p refs Presented at the Nordic Meeting on Nucl. Phys., Fuglso, Denmark, 16-20 Aug. 1982
(Contract W-7405-eng-26)
(DE83-015716; CONF-820896-7) Avail: NTIS HC A03/MF A01

Experimental data and statistical-model calculations for xn and (-)xn products of the reaction (2)ONe + (146)Nd at 136 MeV are shown to be in generally good agreement, indicating that equilibrium processes are dominant. Preliminary results on the heavy-ion ejectiles from (19)F + (159)Tb are presented. DOE

N84-10951# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MOLECULAR-BEAM SCATTERING Thesis
Matthew Fowler Vernon Jul. 1983 389 p refs

(Contract DE-AC03-76SF-00098)
(DE83-016138; LBL-15855) Avail: NTIS HC A17/MF A01

The molecular-beam technique has been used in three different experimental arrangements to study a wide range of inter-atomic and molecular forces. Chapter 1 reports results of a low-energy (0.2 kcal/mole) elastic-scattering study of the He-Ar pair potential. The purpose of the study was to accurately characterize the shape of the potential in the well region, by scattering slow He atoms produced by expanding a mixture of He in N2 from a cooled nozzle. Chapter 2 contains measurements of the vibrational predissociation spectra and product translational energy for clusters of water, benzene, and ammonia. The experiments show that most of the product energy remains in the internal molecular motions. Chapter 3 presents measurements of the reaction Na + HC1 (FEMALE) NAC1 + H at collision energies of 5.38 and 19.4 kcal/mole. This is the first study to resolve both scattering angle and velocity for the reaction of a short lived (16 nsec) electronic excited state. Descriptions are given of computer programs written to analyze molecular-beam expansions to extract information characterizing their velocity distributions, and to calculate accurate laboratory elastic-scattering differential cross sections accounting for the finite apparatus resolution. Experimental results which attempted to determine the efficiency of optically pumping the Li(2(2)P/sub 3/2/) and Na(3(2)P/sub 3/2) excited states are given. A simple three-level model for predicting the steady-state fraction of atoms in the excited state is included. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-10952# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE DEMONSTRATION OF A HIGH-POWER SPACE-REACTOR HEAT-PIPE DESIGN
M. A. Merrigan, E. H. Martinez, E. S. Keddy, J. Runyan, and J. E. Kemme 1983 7 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21-26 Aug. 1983
(Contract W-7405-eng-36)
(DE83-012688; LA-UR-83-1330; CONF-830812-19) Avail: NTIS HC A02/MF A01

Performance of a 15.9-mm diam, 2-m long, artery heat pipe has been demonstrated at power levels to 22.6 kW and temperatures to 15000K. The heat pipe employed lithium as a working fluid with distribution wicks and arteries fabricated from 400 mesh MMo-41 wt % Re screen. Molybdenum alloy (TZM) was used for the container. Peak axial power density attained in the testing was 19 kW/cm(2) at 14650K. The corresponding radial flux density in the evaporator region of the heat pipe was 150 W/cm(2). The extrapolated limit for the heat pipe at its 15000K design point is 30 kW, corresponding to an axial flux density of 25 kW/cm(2). Sonic and capillary limits for the design were investigated in the 1100 to 15000K temperature range. Excellent agreement of measured and predicted temperature and power levels was observed. DOE

N84-10953# Los Alamos Scientific Lab., N. Mex.
SPACE REACTOR PRELIMINARY MECHANICAL DESIGN
K. L. Meier 1983 9 p refs Presented at 18th Intersoc. Energy Conversion Engr. Conf., Orlando, Fla., 21 Aug. 1983
(Contract W-7405-eng-36)
(DE83-012689; LA-UR-83-1329; CONF-830812-20) Avail: NTIS HC A02/MF A01

An analysis was performed on the SABRE reactor space power system to determine the effect of the number and size of heat pipes on the design parameters of the nuclear subsystem. Small numbers of thin walled heat pipes were found to give a lower subsystem mass, but excessive fuel swelling resulted. The SP-100 preliminary design uses 120 heat pipes because of acceptable fuel swelling and a minimum nuclear subsystem mass of 1875 kg. Salient features of the reactor preliminary design are: individual fuel modules, ZrO2 core mounts, bolted collar fuel module restraints, and a BeO central plug. DOE

N84-10954# Los Alamos Scientific Lab., N. Mex.
NEUTRONIC AND THERMAL DESIGN CONSIDERATIONS FOR HEAT-PIPE REACTORS
W. A. Ranken and D. R. Koenig 1983 10 p refs Presented at 18th Intersoc. Energy Conversion Engr. Conf., Orlando, Fla., 21 Aug. 1983
(Contract W-7405-eng-36)
(DE83-012690; LA-UR-83-1331; CONF-830812-21) Avail: NTIS HC A02/MF A01

SABRE (Space-Arena Baseline Reactor) is a 100-kW/sub e/, heat-pipe-cooled, beryllium-reflected, fast reactor that produces heat at a temperature of 15000K and radiatively transmits it to high temperature thermoelectric (TE) conversion elements. The use of heat pipes for core heat removal eliminates single point failure mechanisms in the reactor cooling system, and provides minimal temperature drop radiative coupling to the TE array, as well as automatic, self-actuating removal of reactor afterheat. The question of how the failure of a fuel module heat pipe will affect neighboring fuel modules in the core is discussed, as is fission density peaking that occurs at the core/reflector interface. Results of neutronic calculations of the control margin available are described. Another issue that is addressed is that of helium generation in the heat pipes from neutron reactions in the core with the heat pipe fluid. Finally, the growth potential of the SABRE design to much higher powers is examined. DOE

N84-10955# Los Alamos Scientific Lab., N. Mex.
INITIAL EVALUATION OF MOLYBDENUM-RHENIUM ALLOY FOR REACTOR HEAT PIPES
M. A. Merrigan and L. B. Lundberg 1983 8 p refs Presented at 18th Intersoc. Energy Conversion Engr. Conf., Orlando, Fla., 21 Aug. 1983
(Contract W-7405-eng-36)
(DE83-012687; LA-UR-83-1328; CONF-830812-18) Avail: NTIS HC A02/MF A01

Molybdenum-rhenium alloys containing less than 15% Re were investigated for space nuclear power system applications. A ductile-brittle transition temperature of less than 1350 K was demonstrated for recrystallized Mo-13 wt % Re alloy. Thermophysical properties were measured over the temperature range from ambient to 15000 K and the elastic modulus determined to be 289 GPa. Thermal conductivity of the alloy at temperature was demonstrated as comparable to pure molybdenum. Fabricability of the material was demonstrated and an investigation of weld characteristics initiated. Optimization of alloy composition for the planned application is continuing. DOE

N84-10956# Pacific Northwest Lab., Richland, Wash. Environmental Sciences Dept.
LOW-LEVEL RADIOACTIVE WASTE DISPOSAL IN THE OCEANS
W. L. Templeton Apr. 1983 55 p refs Presented at the NOAA Meeting on Ocean Dumping, Strategies and Policies, Kingston, R.I., 2 May 1983
(Contract DE-AC06-76RL-01830)
(DE83-013367; PNL-SA-11332; CONF-830597-1) Avail: NTIS HC A04/MF A01

A strategy for the management of the disposal of low level radioactive wastes into coastal zones and ocean waters has developed over the past three decades. While there was a substantial increase in the number of international and required agreements there was also a concomitant improvement in understanding of the ocean and the processes at work within it. This has allowed more rigorous and reliable assessments to be made of the radiological consequences. With the continued development of basic guidelines or radiological protection by the International Commission on Radiological Protection (ICRP) methodologies were formulated to derive the fundamental scientific requirement - the

relationship between disposal or release rate to the ocean and the resultant radiation dose to exposed human populations. DOE

N84-10957# Pennsylvania Univ., Philadelphia. Dept. of Physics.
VERY-HIGH-ENERGY NUCLEAR PHYSICS Progress Report
Sherman Frankel Jun. 1983 7 p
(Contract DE-AC02-78ER-04660)
(DE83-013379; DOE/ER-04660/T1) Avail: NTIS HC A02/MF A01

In 1980 and extensive series of experiments on alpha-alpha collisions in the ISR was carried out. The purpose of the experiment was to search for some evidence of new correlated behavior, and, in particular, to search for the existence of the formation of a quark-gluon plasma. The reason for this hope lay in the fact that the ISR experiments were to be carried out at ultrarelativistic energies of 1000 GeV/c in the alpha cm. This is a region where it is known that the mean pion multiplicities are very large and it is possible to sample events with event multiplicities of at least 200. Another important feature was the fact that remarkable spectrometers existed at the ISR to make definitive studies of the whole event structure. The apparatus of the AFS had the capability of detecting 50 charged particles in an apparatus covering 85% of the total solid angle. The momentum of each particle is measured with high accuracy and protons, kaons, pions and their antiparticles were identified, along with natural lambdas and kaons. DOE

N84-10958# California Univ., Livermore. Lawrence Livermore Lab.
INTENSE POSITRON BEAMS: LINACS; PREWORKSHOP COPY
R. H. Howell, R. A. Alvarez, K. A. Woodle (Yale Univ., New Haven, Conn.), S. Dhawan (Yale Univ., New Haven, Conn.), P. O. Egan (Yale Univ., New Haven, Conn.), V. W. Hughes (Yale Univ., New Haven, Conn.), and M. W. Ritter (Yale Univ., New Haven, Conn.) May 1983 10 p refs Presented at the NATO Advan. Res. Workshop on Positron Scattering in Gases, London, 19-23 Jul. 1983
(Contract W-7405-eng-48)
(DE83-012941; UCRL-89212; CONF-830770-1) Avail: NTIS HC A02/MF A01

Beams of monoenergetic positrons with energies of a few eV to many keV have been used in experiments in atomic physics, solid state physics and materials science. The production of positron beams from a new source, an electron linac, is described. Intense, pulsed beams of low energy positrons have been produced by a high energy beam from an electron linac. The production efficiency, moderator geometry, beam spot size and other positron beam parameters have been determined for electrons with energies from 60 to 120 MeV. Low energy positron beams produced with a high energy electron linac can be of much higher intensity than those beams currently derived from radioactive sources. These higher intensity beams will make possible positron experiments previously infeasible. DOE

N84-10959# Los Alamos Scientific Lab., N. Mex. Accelerator Technology Div.
ION-SOURCE AND ION-ACCELERATOR DEVELOPMENT AT LOS ALAMOS
R. A. Jameson 1983 12 p refs Presented at the 7th Symp. on Sources and Ion Assisted Technol. and the 4th Intern. Conf. on Ion and Plasma Assisted Techniques, Kyoto, 12-16 Sep. 1983
(Contract W-7405-eng-36)
(DE83-014123; LA-UR-83-1751; CONF-830920-3) Avail: NTIS HC A02/MF A01

Intense, low emittance ion beam generation and acceleration is a primary, continuing research and development activity in the Accelerator Technology Division of the Los Alamos National Laboratory, USA. The types and characteristics of ion source, extraction, and beam transport systems that we have tested and some of the improvements made to the design and simulation tools for components of injector systems are described. Acceleration of low velocity ions has been revolutionized by the radio frequency quadrupole (RFQ) accelerator, introduced in the USSR, pioneered at Los Alamos in the USA, and now under intense development around the world. Recent experimental results and extensions of design capabilities at Los Alamos are discussed. DOE

74 OPTICS

Includes light phenomena.

N84-10960 Northwestern Univ., Evanston, Ill.
COHERENCE AND TURBULENCE EFFECTS ON THE INTENSITY SCINTILLATIONS AT OPTICAL FREQUENCIES Ph.D. Thesis
Yahya Kemal Baykal 1982 227 p
Avail: Univ. Microfilms Order No. DA8305457

Intensity fluctuations in atmospheric turbulence are formulated for partially coherent sources using the extended Huygens-Fresnel principle and Rytov's method. Temporal source coherence is introduced by a delta function correlation model for frequency. Spatial source coherence is modelled by a random source phase composed of random shift and random tilt. Using the extended Huygens-Fresnel principle, formulas for the scintillation index in weak turbulence that are valid for all degrees of source coherence are obtained. Solutions include the cases of slow and fast detector response times. Results correctly reduce to the known scintillations in the limit of the coherent and the incoherent source. As an application of our results, a general expression is found for the average transmittance that includes both the coherence and turbulence effects. Lowtran transmittance is modified both by the average transmittance and the scintillation index due to turbulence when the source is spatially incoherent. Dissert. Abstr.

N84-10961# Texas Technological Univ., Lubbock. Optical Systems Lab.
SPACE-VARIANT OPTICAL SYSTEMS Annual Technical Report, 30 Sep. 1981 - 30 Sep. 1982
John F. Walkup and Thomas F. Krile Nov. 1982 14 p refs
(Grant AF-AFOSR-0076-79; AF Proj. 2305)
(AD-A130096; AFOSR-83-0553TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Analytical and experimental investigations of 2-D space-variant optical processing techniques have been conducted. Coherent processing investigations have included (1) a continuing experimental study of the characteristics of UV-exposed photoresist phase masks for multiplex holography, and (2) both analytical and experimental studies of a technique for using wavelength-encoded tandem 1-D processors for performing 2-D processing. In the area of incoherent processing, we have completed an investigation of a tristimulus-based technique for performing complex operations using hue, saturation, and intensity parameters to represent complex numbers. Author (GRA)

N84-10962# Rome Air Development Center, Griffiss AFB, N.Y.
FURTHER CONSIDERATIONS IN MODELS OF ROUGH SURFACE SCATTERING
Robert J. Papa, John F. Lennon, and Richard L. Taylor Nov. 1982 71 p refs
(AF Proj. 2305)
(AD-A130424; RADC-TR-82-326) Avail: NTIS HC A04/MF A01 CSCL 20/14

Several models have been developed to calculate the coherent (specular plus direct) and incoherent multipath power reaching a monopulse receiver from a beacon located over rough terrain. These models are based upon physical optics and include both Gaussian and exponential statistical distributions in surface heights. The theoretical models relate statistical parameters describing the surface to the normalized scattering cross section of the surface. This report is concerned with three topics, in each of which characteristics of the scattering from the surface depend on the degree of roughness. The first is the changes in form of the mathematical representation for normalized scattering cross sections as the degree of roughness is varied. The next topic is

concerned with alternative definitions of the glistening surface (the part of the rough surface from which diffuse power is scattered into the receiver). It is shown that, for some parameter ranges, the usual definition of glistening surface as given by Beckmann and Spizzichino is not adequate. In the final topic, the effect of the moisture content of the soil on surface scattering as a function of roughness is discussed. A wide range of results is presented in each of these areas. The implications of these findings for the prediction of system performance are discussed. Author (GRA)

N84-10963# Science Applications, Inc., McLean, Va.
IMAGE UNDERSTANDING, 14TH WORKSHOP Annual Technical Report, Oct. 1982 - Jun. 1983
Lee S. Baumann Jun. 1983 359 p refs Workshop held at Arlington, Va., 23 Jun. 1983
(Contract MDA903-82-C-0160; ARPA Order 3456)
(AD-A130251; SAI-84-176-WA) Avail: NTIS HC A16/MF A01 CSCL 20/6

Technical and annual progress reports of principal investigators of image understanding are presented. Topics covered include: surface constraint from linear ententes; computing visual correspondance; smoothing optical flow fields; viewframes; a connectionist model of form perception; use of difference fields in processing sensor motion; a facet approach to optic flow; special purpose automatic programming for 3-d model-based vision; MAPS: organization of a spatial data base system using imagery, terrain, and map data; segment-based stereo matching; software metrics for performance analysis of parallel hardware; scene analysis algorithms; and robot vehicles. A.R.H.

N84-10964# Sonicraft, Inc., Chicago, Ill.
ATMOSPHERIC TRANSMITTANCE/RADIANCE COMPUTER CODE FASCOD2 Final Report, Jun. 1979 - Oct. 1982
Oct. 1982 96 p refs
(Contract F19628-79-C-0120; AF Proj. 7670)
(AD-A130241; AFGL-TR-82-0392) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report continues the development of a line-by-line radiative transfer code for inhomogeneous, spherical atmospheres with refractive bending. Optical path calculations and properties for standard atmospheres are combined with the radiative transfer processes to form an integrated program. The code is then modified to include non-LTE effects on radiance and transmittance at the higher altitudes. For accurate continuum absorption near band heads, a new sub-Lorentzian form factor is developed that is compatible with the codes algorithm for line modeling. The CO2 continuum is studied as a particular example. All new computer coding and theoretical developments are documented and supported with example calculations. Author (GRA)

N84-10965# Hughes Research Labs., Malibu, Calif.
INVESTIGATION OF OPTICAL FIBERS FOR NONLINEAR OPTICS Annual Report, 1 Jan. - 31 Dec. 1982
Larry G. DeShazer, James A. Harrington, Antonio C. Pastor, Ricardo C. Pastor, and Stephen C. Rand Feb. 1983 46 p refs
(Contract F49620-82-C-0030; AF Proj. 2301)
(AD-A130656; AFOSR-83-0598TR; AR-1) Avail: NTIS HC A03/MF A01 CSCL 20/6

The principal objective of this research program is to develop single crystal (SC) fibers for use in nonlinear optical devices. This encompasses measurement of physical and chemical properties of several candidate materials, fabrication of SC fibers, and demonstration of nonlinear optical applications. Author (GRA)

N84-10966# SRI International Corp., Menlo Park, Calif.
LIDAR (LIGHT DETECTION AND RANGING) MEASUREMENTS FOR ASTRONOMICAL REFRACTION. FEASIBILITY AND SYSTEM DEFINITION STUDY Final Contractor Report, 1 Apr. - 30 Sep. 1981
Stephen A. DeLateur Feb. 1983 46 p refs
(Contract N66001-81-R-0249; SF59551697)
(AD-A130740; NOSC-CR-168) Avail: NTIS HC A03/MF A01 CSCL 03/2

Recent improvements in mechanical and optical instrumentation precision have occurred. Therefore, the removal of meteorologically caused systematic errors is now a major consideration in stellar position accuracy and in the repeatability of arrangement in positions taken during nightly observations. The two problems singled out in this report are absolute water vapor content and temperature structure measurements. The study revealed that (1) estimates of water vapor distribution with an accuracy of approximately 20% would routinely correct position errors of 0.01 of angle and (2) that knowledge of the temperature structure with an accuracy of 0.5K would remove the systematic errors caused by isopycnic tilts, which range from 0.01 up to 0.1 of angle at extreme zenith viewing angles. The study showed that a remote-sensing solution to the measurement problems of the U.S. Naval Observatory in Washington, DC, is provided by LIDAR (Light Detection and Ranging). Two major LIDAR systems that fulfill the Observatory's needs are based on Raman and DIAL (Differential Absorption Lidar) techniques. A study and review of experimental system using the DIAL and Raman techniques indicate tht a DIAL system is the recommended approach for simultaneous measurement of water vapor density and temperature. A DIAL system should be constructed to obtain ground-based vertical water vapor and temperature measurements. Further, alexandrite should be used as the lasing medium for the LIDAR system. GRA

N84-10967# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
FINDING EDGES AND LINES IN IMAGES M.S. Thesis
John Francis Canny Jun. 1983 149 p refs
(Contract N00014-80-C-0505)
(AD-A130824; AI-TR-720) Avail: NTIS HC A07/MF A01 CSCL 20/6

The problem of detecting intensity changes in images is canonical in vision. Edge detection operators are typically designed to optimally estimate first or second derivative over some (usually small) support. Other criteria such as output signal to noise ratio or bandwidth have also been been argued for. This thesis is an attempt to formulate a set of edge detection criteria that capture as directly as possible the desirable properties of an edge operator. Variational techniques are used to find a solution over the space of all linear shift invariant operators. The first criterion is that the detector have low probability of error i.e. failing to mark edges or falsely marking non-edges. The second is that the marked points should be as close as possible to the center of the true edge. The third criterion is that there should be low probability of more than one response to a single edge. The technique is used to find optimal operators for step edges and for extended impulse profiles (ridges or valleys in two dimensions). The extension of the one dimensional operators to two dimensions is then discussed. The result is a set of operators of varying width, length and orientation. The problem of combining these outputs into a single description is discussed, and a set of heuristics for the integration are given. Author (GRA)

N84-10968# Electronics Research Lab., Adelaide (Australia).
ATMOSPHERIC IR TRANSMISSION DATA FOR A TEMPERATE MARITIME ENVIRONMENT
D. R. Cutten Feb. 1983 70 p
(AD-A131035; ERL-0265-TR) Avail: NTIS HC A04/MF A01 CSCL 04/1

Measurements are reported on infrared transmission through the atmosphere at a coastal marine site in a temperature environment. Ten broadband spectral regions were used and variations of transmittance with absolute humidity and visibility over paths of 5 and 9 km investigated. All data have been compared with the predictions of the AFGL computer code LOWTRAN 5. The discrepancy reported previously between the measured and calculated data in the 4.4 to 5.4 micrometer region still exists, although new data on the water continuum absorption coefficients for this region have reduced this. Reasonable agreement has been shown to exist in the 8 to 12 micrometer region for absolute humidities up to 12 gm/cu m. The results oft of the comparisons for the 1 to 2.5 micrometer region showed a greater discrepancy.

Some of this discrepancy could be arising from point measurements of aerosol extinction using equipment which is underestimating the aerosol attenuation coefficient. Data on scintillation fluctuations recorded during the transmittance measurements are also presented. Author (GRA)

N84-10969# Naval Research Lab., Washington, D. C.
OPTICAL WAVEGUIDE GAS SENSORS Interim Technical Report, 1 Nov. 1982 - 31 May 1983
J. F. Giuliani, H. Wohltjen, and N. L. Jarvis 13 Jul. 1983 15 p refs Submitted for publication
(AF Proj. 2739)
(AD-A130629; NRL-TR-1) Avail: NTIS HC A02/MF A01 CSCL 09/1

The discoveries of solid organic film coatings exhibiting color change reactions to specific vapors have made it possible to detect weak surface chemical reactions at the film-vapor interface by means of a multiple reflecting optical probe. A brief review of total multiple reflection and the application of two prototype devices built at NRL for the detection of low concentrations of ammonia and organophosphonate vapors is presented. Preliminary data characterizing both devices with regards to vapor response, reversibility, etc., will be discussed. Several design modification are suggested to improve our devices. Author (GRA)

N84-10970# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
IN-SITU LIGHT SCATTERING TECHNIQUES FOR DETERMINING AEROSOL SIZE DISTRIBUTIONS AND OPTICAL CONSTANTS Final Report, 1 May 1974 - 30 Apr. 1983
Gerald W. Grams 29 Jun. 1983 81 p refs
(Contract DAAG29-79-C-0092)
(AD-A131363; ARO-16462.1-GS) Avail: NTIS HC A05/MF A01 CSCL 20/6

The research performed under this program has focused on studying optical properties of non-spherical particles in the laboratory. It required the development of techniques for routinely generating and collecting artificial aerosols of known chemical composition, for performing light scattering measurements, and for interpreting light scattering data. Progress on each technique has been achieved, and the principal results for each of these three basic activities are discussed in this report. GRA

N84-10971# Sandia Labs., Albuquerque, N. Mex.
EDGE-SEALED PLZT SHUTTERS FOR OPERATION IN HIGH-HUMIDITY/TEMPERATURE ENVIRONMENTS
Robert P. Cutler and James O. Harris, Jr. 1983 6 p refs Presented at the IEEE Intern. Symp. on Applications of Ferroelectrics, Gaithersburg, Md., 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012627; SAND-83-0100C; CONF-830637-1) Avail: NTIS HC A02/MF A01

Present PLZT lenses degrade significantly in the presence of high humidity. Two methods were developed to seal the lenses to overcome this problem. The design and fabrication of the first edge sealed PLZT lens assemblies are described, and data are presented showing performance differences between nonsealed and sealed lens assemblies following exposure to high humidity/temperature environments. DOE

N84-10972# Los Alamos Scientific Lab., N. Mex.
FAST, NON-LINEAR OPTICAL-SCATTERING SPECTROSCOPY IN SHOCK-COMPRESSED ORGANIC LIQUIDS
S. C. Schmidt, David S. Moore, D. Schiferl, and J. W. Shaner 1983 15 p refs Presented at the 9th Intern. Colloq. on Dyn. of Explosions and Reactive Systems, Poitier, France, 4-8 Jul. 1983
(Contract W-7405-eng-36)
(DE83-007548; LA-UR-83-351; CONF-830704-2) Avail: NTIS HC A02/MF A01

Nanosecond stimulated Raman and coherent anti-Stokes Raman scattering spectroscopy were used to determine molecular vibrational frequency shifts and changes of phase in shock-compressed organic liquids. Results of dynamic experiments are compared to static Raman scattering measurements of samples, compressed and heated in a diamond-anvil cell. Objectives of the experiments are to determine the molecular structure and ultimately the energy transfer mechanisms in shock-compressed condensed phase materials. DOE

N84-10973# Rochester Univ., N. Y. Lab. for Laser Energetics.
DEVELOPMENT OF A FOCUSSING-CRYSTAL SPECTROGRAPH FOR X-RAYS FROM LASER-FUSION TARGETS Final Report, period ending 30 Sep. 1982
B. Yaakobi and A. J. Burek Jan. 1983 130 p refs
(Contract DE-AS08-81DP-40128)
(DE83-012801; DOE/DP-40128/1) Avail: NTIS HC A07/MF A01

Von-Hamos X-ray spectrograph consists of a cylindrically-curved crystal whose axis normally lies in the plane of the recording film (for another detector) and the radiation source also lies in this axis. A wide range spectrum is obtained on the film with a flux which is higher than in the corresponding flat crystal case by a large factor. This factor is of order of the ratio between the crystal radius of curvature and the source radius, hence, for laser fusion targets its value can be several hundreds. The fact that this device is optimally suited for sources of small spatial extent was the motivation for developing and using it on laser fusion experiments for the first time. One important potential application of the Von-Hamos spectrograph would be in diagnosing high density low temperature imploded targets in ablative, laser implosion experiments. However, the implosion pectra shown were obtained in short pulse, small target experiments leading to high core temperatures (e to 4 keV). The instrument capabilities are evident by the fact that sub-Angstrom wavelength lines (shorter than any previously obtained spectral lines from hot plasmas) were recorded with high sensitivity; in fact, very severe attenuation was necessary to avoid film saturation. DOE

N84-10974# Sandia Labs., Albuquerque, N. Mex. Shock Wave and Explosive Physics Div.
GENERATION OF ULTRAFAST OPTICAL FIDUCIALS FOR SHOCK-WAVE EXPERIMENTS
Brian W. Dodson 1983 6 p refs Presented at the 27th Ann. Intern. Tech. Symp. on High Speed Phot., Videography and Photonics, San Diego, Calif., 21 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-013765; SAND-83-1106C; CONF-830874-2) Avail: NTIS HC A02/MF A01

Recent advances in high time resolution optical diagnostic instrumentation for shock wave experiments in condensed media (especially timing resolved spectroscopy) have resulted in new challenges concerning the timing of such experiments. A technique for detecting the presence of a shock wave through the generation of an optical fiducial signal, which is detected and recorded directly by the optical recording device (typically a streak camera) is presented. This technique, which is based on Stress Induced Defeat of Total Internal Reflection (SIDTIR), requires only simple apparatus and set up, and offers fiducial transition times as short as 50 psec in a reasonable experimental configuration. DOE

N84-10359# Joint Publications Research Service, Arlington, Va.
ACADEMICIAN OUTLINES ACCOMPLISHMENTS, NEW DEVELOPMENTS IN OPTICAL PHYSICS
In its USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 66-75 Transl. into ENGLISH from Kommun. Belorussii (Minsk), no. 4, Apr. 1983 p 65-72 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

N84-10975# Nagoya Univ. (Japan). Inst. of Plasma Physics.
X-RAY SPECTROSCOPIC STUDY OF HIGH-TEMPERATURE

PLASMAS BY CURVED CRYSTAL SPECTROMETER
Shigeru Morita Jul. 1983 208 p refs
(IPPJ-639) Avail: NTIS HC A10/MF A01

Extensive studies were carried out on the structures of X-ray spectra from highly stripped ions of first transition elements and their behavior in a high temperature plasma using a high resolution crystal spectrometer. Calculations are mde on the design and the use of a curved crystal spectromter for plasma diagnostics. A Johann type crystal spectrometer for measuring the X-ray lines was constructed on the basis of the calculations. The spectral resolution and sensitivity of the curved crystal spectrometer (crystal: LiF(200), bending radius: 100 cm) are measured with a position sensitive detector of photodiode array calibrated using a proportional counter. A vacuum spark was constructed for producing a high temperature plsma which emits the X-ray lines from the highly stripped ions. The results of the experimenal studies for the X-ray spectroscopic measurements are presented. Author

N84-10976# Berkeley Scholars, Inc., Calif.
THEORETICAL RESEARCH ON CHARGED PARTICLE BEAM AND OTHER PLASMA SYSTEMS Final Report, Apr. 1981 - Apr. 1982
May 1983 13 p
(Contract N00014-81-C-2355)
(AD-A130381; PD-BSI-83-293R) Avail: NTIS HC A02/MF A01 CSCL 20/5

The research involved the theoretical analysis of charged particle beam and other plasma systems. The major emphasis of the research was on modeling the free-electron-laser (FEL) oscillator. The approach was to utilize a first order description for the evolution of relativistic electron beam pulses in a cavity with an applied wiggler magnetic field to develop a model for the modal electromagnetic energy in a FEL oscillator. GRA

N84-10977# Naval Research Lab., Washington, D. C.
ANODE PLASMA EXPANSION IN PINCH-REFLEX DIODES Interim Report
D. G. Colombant and Shyke A. Goldstein 16 Aug. 1983 17 p refs
(Contract DE-AI08-79DP-40092)
(AD-A131083; NRL-MR-5148) Avail: NTIS HC A02/MF A01 CSCL 12/1

Anode plasma expansion in pinch reflex diodes is investigated using a one-dimensional magneto-hydrodynamic model. Early in time, the plasma undergoes thermal expansion and its front is slowed down due to jxB. After the current has reached its maximum and for small radius where j and B are larger, jxB may accelerate the bulk of the anode plasma to large velocities. Good qualitative agreement is obtained with the experimental observations of the time dependence of the plasma velocity as well as its radial profile. The maximum expansion velocities reach tens of cm/microsecs. GRA

N84-10978# JAYCOR, Alexandria, Va.
POLARIZATION STUDIES IN ELECTRON CYCLOTRON HEATING EXPERIMENTS ON THE VERSATOR 2 TOKAMAK Final Report, 25 Aug. 1980 - 25 Aug. 1981
30 Jul. 1982 24 p refs
(Contract N00173-80-C-0429)
(AD-A130808; AD-E001391; JAYCOR-J206-82-011/6202) Avail: NTIS HC A02/MF A01 CSCL 18/1

Preliminary results of the ECH experiment using the MIT Versator 2 with polarized microwave radiation were obtained. Decreases in both loop voltage and line average plasma density were measured as a function of power and toroidal angle of microwave beam injection. Thompson scattering measurements indicate an increase in the central electron temperature. These investigations showed a distinct asymmetry behavior for both polarizations. GRA

N84-10979# Mission Research Corp., Santa Barbara, Calif.
FORBIDDEN LINE RADIATION COOLING OF HIGH ALTITUDE PLASMAS Topical Progress Report, 1 Feb. 1981 - 1 Feb. 1982
W. W. White 19 Feb. 1982 108 p refs
(Contract DNA001-80-C-0096)
(AD-A131266; DNA-6125T; MRC-R-687) Avail: NTIS HC A06/MF A01 CSCL 18/3

Time dependent rate equations describing electron impact excitation (and Deexcitation) of and forbidden line radiation from ionospheric constituents have been integrated to obtain excited state population densities, radiation rates, ion and electron temperatures, and energy partitions as a function of time. Radiations from low-lying metastable states of oxygen and nitrogen ions, oxygen and nitrogen atoms, and molecular oxygen excited by electrons in the one eV energy range have been computed for plasma compositions characteristics of selected high altitude nuclear explosions. Author (GRA)

N84-10980# Texas Univ., Austin. Inst. for Fusion Studies.
IMPACT OF CLUMPS ON PLASMA STABILITY AND THE NATURE OF TURBULENCE IN A SATURATED STATE
P. W. Terry and P. H. Diamond May 1983 31 p refs
(Grant DE-FG05-80ET-53088)
(DE83-012927; DOE/ET-53088/91) Avail: NTIS HC A03/MF A01

Phase-space density granulations (clumps) are studied using the theory of two point phase space density correlation. A mechanism of extraction of expansion free energy is described. This mechanism affects questions pertaining to nonlinear stability. Theories for two point correlation for the universal mode in a slab geometry with shear and trapped electrons in toroidal geometry are discussed. Results are presented which show destabilization of the universal mode and enhancement of the trapped electron growth rate. An analytic formula for the width of the frequency spectrum is obtained. By specifying the collective resonance damping mechanism, the wavenumber spectrum is also calculated. A formula or energy flux illustrates the impact of clumps on transport and energy confinement. DOE

N84-10981# Texas Univ., Austin. Inst. for Fusion Studies.
VARIATIONAL METHOD FOR THE THREE-DIMENSIONAL INVERSE-EQUILIBRIUM PROBLEM IN TOROIDS: PART 2
A. Bhattacharjee, J. C. Wiley, and R. L. Dewar (Australian National Univ.) May 1983 26 p refs
(Contract DE-AC05-79ET-53036; Grant DE-FG05-53088)
(DE83-012925; DOE/ET-53088/85) Avail: NTIS HC A03/MF A01

A variational method, which was recently proposed for computing the inverse solutions for three dimensional magnetostatic equilibria, is generalized to allow for variations in the magnetic toroidal angle. The procedure improves the accuracy and convergence properties of the method. DOE

N84-10982# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
RAY-TRACING ANALYSIS OF ELECTRON-CYCLOTRON-RESONANCE HEATING IN STRAIGHT STELLARATORS
Kosuke Kato May 1983 128 p refs
(Contract DE-AC02-78ET-51013)
(DE83-013854; DOE/ET-51013/83; PFC/RR-83-13) Avail: NTIS HC A07/MF A01

A ray tracing computer code is developed and implemented to simulate electron cyclotron resonance heating (FCRH) in stellarators. A straight stellarator model is developed to simulate the confinement geometry. Following a review of FCRH, a cold plasma model is used to define the dispersion relation. To calculate the wave power deposition, a finite temperature damping approximation is used. 3-D ray equations in cylindrical coordinates are derived and put into suitable forms or computation. The three computer codes, MAC, HEFA, and GROUT, developed for this research, are described next. FCRH simulation is then carried out for three models including Heliotron E and Wendelstein VII A.

Investigated aspects include launching position and mode scan, frequency detuning, helical effects, start-up, and toroidal effects. Results indicate: (1) an elliptical waveguide radiation pattern, with its long axis oriented half-way between the toroidal axis and the saddle point line, is more efficient than a circular one; and (2) mid-plane, high field side launch is favored for both O- and X-waves. DOE

N84-10983# JAYCOR, San Diego, Calif.
THE 2-STEP ECRH CURRENT-DRIVE STUDY Final Report
S. Hamasaki, N. A. Krall, J. L. Sperling, G. F. Guest (Applied Microwave Plasma Concepts, Inc., Encinitas, Calif.), and R. Dandl (Applied Microwave Plasma Concepts, Inc., Encinitas, Calif.) 8 Apr. 1983 61 p refs
(Contract DE-AC03-82ER-51031)
(DE83-012745; DOE/ER-51031/T1) Avail: NTIS HC A04/MF A01

Theoretical descriptions were developed of the pump and detrapping steps of the two-step ECRH current drive permit an identification of critical issues and an estimte of the overall figure-of-merit for this approach. The descriptions are based largely on single particle interactions with FCRH electromagnetic fields in magnetic geometries that exhibit mirror-like properties. The computations include the effects of gyrophase, velocity space pitch angle, wave amplitude, and magnetic field geometry. The calculations of the heating of the electrons in the pump step assume resonance occurs near the maximum of the magnetic field where the parallel velocity of the particles is small, while the detraping process was evaluated near the minimum field at the bottom of the magnetic well where the parallel velocity of the trapped particles is large. Several alternative approaches for heating the electrons to collisionless energies in the pump step were evaluated.

N84-10984# Naval Research Lab., Washington, D. C.
STIMULATED BRILLOUIN BACKSCATTER IN LONG SCALE LENGTH PLASMAS Interim Report
D. G. Colombant, W. M. Manheimer, and J. H. Gardner 24 Jun. 1983 31 p refs
(Contract DE-AI08-79DP-40092)
(DE83-013817; AD-A129785; NRL-MR-5118) Avail: NTIS HC A03/MF A01

Stimulated Brillouin backscattering in long scale length plasmas is calculated using a wave kinetic model. These calculations make use of computer hydrodynamic profiles for these plasmas. Results are presented for the parameters of the joint NRD-DDND experiments and for reactor size pallets of 5 mm characteristic length. Means of reducing high levels of backscatter for the latter case are investigated. DOE

N84-10985# Department of Energy, Washington, D. C. Office of Fusion Research.
FUSION TECHNOLOGY DEVELOPMENT PLAN
May 1983 138 p refs
(DE83-012954; DOE/ER-0166) Avail: NTIS HC A07/MF A01

This Fusion Technology Development Plan (FTDP) was prepared to show how the technology development program conducted by the Division of Development and Technology of the Office of Fusion Energy supports the overall magnetic fusion energy program as delineated in the March 17, 1983, DOE testimony before the Energy Research and Production Subcommittee of the House Committee on Science and Technology. A first draft of this plan distributed for comment in November 1981. Since that draft was prepared, changes in expectations for funding in the program have led to development of a set of priorities based on critical technology issues. These critical issues and the priority ranking of technology development efforts was accomplished with help from each of the major program participants. DOE

N84-10986# New Mexico Univ., Albuquerque.
MODEL FOR THE SATURATION OF THE HYDROMAGNETIC RAYLEIGH-TAYLOR INSTABILITY
N. F. Roderick and T. W. Hussey (Sandia Labs., Albuquerque, N. Mex.) 1983 15 p refs Presented at the IEEE Intern. Conf. on Plasma Sci., San Diego, Calif., 22 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-012629; SAND-83-1239C; CONF-830590-1) Avail: NTIS HC A02/MF A01

The saturation of the hydromagnetic Rayleigh-Taylor instability is caused by the reduction of driving current in the bubble region between the spikes formed as the instability develops. For short wavelengths, linear magnetic-field diffusion provides the necessary smoothing of the magnetic field to reduce the driving force. For wavelengths longer than the magnetic diffusion length, the current is sorted through material which expands into the bubble region. This initially low-density material accumulates in the bubble and eventually provides a source of sufficiently high conductivity plasma, which reduces magnetic field penetration to the front of the bubble. Simple analytic models were developed to verify and quantify these predictions. These models were compared with two dimensional magnetohydrodynamic calculations for imploding plasma shells and give good agreement with these more detailed simulations. DOE

N84-10987# Texas Univ., Austin. Inst. for Fusion Studies.
HEAT CONDUCTION PROCESS IN TOKAMAK HOT-ION PLASMAS
A. A. Ware Jun. 1983 46 p refs
(Contract DE-FG05-80ET-53088)
(DE83-014884; DOE/ET-53088/96) Avail: NTIS HC A03/MF A01

The two-component ion distribution observed with active charge-exchange measurements on PDX are explained using the Fokker-Planck drift-kinetic equation and assuming ion self collisions are dominant for energy scattering. The energetic tail of the distribution, which is diffusing outwards in radius and down in energy, must retain an approximately constant effective temperature T/sub H/ = (- par. delta 1 n f/sub i//mpar. deltaepsilon) (+1). The discontinuity in the slope of 1n f/sub i/ is shown to be the boundary between the inward and outward diffusion parts of f/sub i/ and is a form of contact discontinuity. Energy-scattering collisions with electrons or circulating-beam ions, when important, modify the constancy of T/sub H/. DOE

N84-10988# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
EFFECTS OF REFLECTIONS AND TRAPPED IONS ON THE THERMIONIC EMITTER SHEATH
G. L. Main and S. H. Lam 1983 28 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug. 1983
(Contract DE-AC02-76ET-15352)
(DE83-010233; CONF-830812-1) Avail: NTIS HC A03/MF A01

The theoretically reducible part of the plasma arc-drop (that which is attributable to plasma resistance) of a thermionic energy converter operating in the ignited mode is ultimately attributed to the loss of positive ions and plasma electrons to the electrodes. Most experimental converter C-V characteristics exhibit a region with a relatively constant and small value of convertr current at the foot of the relatively sharply rising Boltzmann region. Little attention was paid to this region because its output power is usually very small (in spite of the favorable arc-drop values). Occasionally this region is simply dismissed as operating in the diffusion mode without further comment or study. The effects of the reflection and trapping of positive ions at current levels where this low plateau region appears are explored. However, contrary to the experimental results, all analytical calculations performed so far indicate that a consequence of reflection and trapping is an increase in arc-drop. DOE

N84-10989# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
RADIAL PLASMA MEASUREMENTS AND CALCULATIONS IN THE CENTER OF A 3-METER LASER-HEATED THETA PINCH Final Report
D. D. Lowenthal, D. C. Quimby, and A. L. Hoffman May 1983 54 p refs

(Contract DE-AC06-76ET-53027)
(DE83-015545; DOE/ET-53027/1) Avail: NTIS HC A04/MF A01

Experimental results are reported on the process of density minimum creation and maintenance in the center of a 3-m-long laser-heated fast solenoid. These results are correlated with one dimensional magnetohydrodynamic calculations and scaling laws are developed for both heating efficiency and for the length of time a density minimum could be maintained against diffusive processes. Both absorption and diffusion are classical and the density minimum maintenance time scales linearly with the plasma line density. Small laser-beam diameters result in long density minimum maintenance times, but also introduce heating inefficiencies due to the non-uniform illumination. In the present experiments, the plasma energy decay time is governed by thermal diffusion to a cold edge layer produced by small amounts of entrapped wall impurity. DOE

N84-10990# California Univ., Livermore. Lawrence Livermore Lab.
FUELING OF FUSION DEVICES BY PELLET INJECTION: DEVELOPMENT IN THE USA
Charles D. Hendricks 14 Jun. 1983 16 p refs Presented at the 9th Intern. Vacuum Congr. and at the 5th Intern. Conf. on Solid Surfaces, Madrid, 26 Sep. - 1 Oct. 1983
(Contract W-7405-eng-48)
(DE83-013706; UCRL-89163; CONF-8309103-1) Avail: NTIS HC A02/MF A01

A comprehensive review of the pellet injector program is given. Some operational basics and future prospects of light gas guns, centrifugal techniques, and railgun accelerators are discussed. DOE

N84-10991# Los Alamos Scientific Lab., N. Mex.
STUDIES OF AN INDUCTIVELY COUPLED PLASMA WITH A FOURIER-TRANSFORM SPECTROMETER
L. M. Faires, B. A. Palmer, R. Engleman, Jr., and T. M. Niemczyk 1983 7 p refs Presented at the Soc. of Photo-Opt. Instrumentation Engr. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract W-7405-eng-36)
(DE83-014194; LA-UR-83-1686; CONF-830425-23) Avail: NTIS HC A02/MF A01

The inductively coupled plasma (TCP) excitation source for analytical atomic spectroscopy has been studied with the one meter Fourier transform spectrometer (FTS) located at Kitt Peak National Observatory, Tucson, Arizona. The high resolution of this spectrometer combined with the comprehensive wavelength coverage or the Fourier transform technique, allows the use of the spectra for elucidation of spectraphysical properties such as excitation temperatures and line widths. From these studies, the analytical applicability of the ICP-FTS combination is evaluated for atomic spectrochemical measurements in the visible and ultraviolet. DOE

N84-10992# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DEVELOPMENT OF AN ENGINEERING-SCALE NUCLEAR TEST OF A SOLID-BREEDER FUSION-BLANKET CONCEPT
Gary A. Deis, Theodore S. Bohn, Peter Y. Hsu, Lowell G. Miller, A. Jerry Scott, Kenneth D. Watts, and Edwin C. Welch Aug. 1983 59 p refs
(Contract DE-AC07-76ID-01570)
(DE83-016861; EGG-FT-6111) Avail: NTIS HC A04/MF A01

As part of the Phase I effort on Program Element-II (PE-II) of the Office of Fusion Energy/Argonne National Laboratory First Wall/Blanket/Shield Engineering Technology Program, a study has been performed to develop preconceptual hardware designs and preliminary test program descriptions for two fission reactor based tests of a water cooled, solid breeder fusion reactor blanket concept. First, a list of potentially acceptable reactor facilities is developed, based on a list of required reactor characteristics. From this set of facilities, two facilities are selected for study: the Oak Ridge Research Reactor (ORR) and the Power Burst Facility (PBF). A test which employs a cylindrical unit cell of a solid breeder fusion reactor blanket, with pressurized water cooling is designed for each facility. The test design is adjusted to the particular characteristics of each reactor. These two test designs are then compared on the basis of technical issues and cost. Both tests can satisfy the PE-II mission: blanket thermal hydraulic and thermomechanical issues. In addition, both reactors will produce prototypical tritium production rates and profiles and release characteristics with little or no additional modifications. DOE

N84-10993# Los Alamos Scientific Lab., N. Mex.
RECENT RESULTS FROM THE ZT-40M REVERSED-FIELD PINCH PROGRAM
R. G. Watt, A. R. Jacobson, R. S. Massey, and J. P. Mondt 1983 5 p refs Presented at the 11th European Conf. on Controlled Fusion and Plasma Phys., Aachen, West Germany, 5-9 Sep. 1983
(Contract W-7405-eng-36)
(DE83-014149; LA-UR-83-1903; CONF-830908-1) Avail: NTIS HC A02/MF A01

Details of equilibrium control and resultant discharge behavior on ZT-40M will be presented. Interesting results in several operating regimes and possible theoretical interpretations will be discussed. DOE

N84-10994# Los Alamos Scientific Lab., N. Mex.
FLUCTUATIONS IN 3 LOS ALAMOS EXPERIMENTS
Bradford L. Wright 1983 18 p refs Presented at the Spring Coll. on Radiation in Plasmas, Trieste, Italy, 9-17 Jun 1983
(Contract W-7405-eng-36)
(DE83-014158; LA-UR-83-1596; CONF-830683-1) Avail: NTIS HC A02/MF A01

Results were reviewed from three magnetic fusion experiments at Los Alamos: the magnetized coaxial source; and the FRX-C, a field-reversed configuration generated by theta-pinch techniques. These experiments share the common feature that a major fraction of the confining magnetic field is associated with currents carried by the plasma. The important role that fluctuations play in the maintenance and evolution of these configurations was emphasized. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-10995# British Library Lending Div., Boston Spa (England).
THERMODYNAMIC ESTIMATION OF INFLUENCE OF ALLOYING ON STICKING FAULT ENERGY OF BCC METALS
L. M. Kryukova, A. N. Ivanov, and I. A. Tomilin 14 Jul. 1983 3 p refs Transl. into ENGLISH from Izv. Vyssch. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1982 p 154-155
(BLL-M-30130-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The influence of alloying with interstitial elements (AIE) and substitutional elements (ASE) on the magnitude of the stacking fault energy of bcc metals was determined. By regarding a stacking fault as a region with a fcc coordination of atoms, the concentration dependences of change in the stacking fault energy in Fe-AIE and Fe-ASE-AIE alloys were obtained. The case of equality of concentration of ASE in the matrix and in the fault region were examined. It was found that increase in the concentration of carbon and nitrogen reduces the stacking fault energy, the additions of carbon being more effective. Additional alloying with manganese and chromium increases the effect of reducing the stacking fault energy, while additions of cobalt increase this energy by comparison with an unalloyed alloy. A.R.H.

N84-10996# British Library Lending Div., Boston Spa (England).
DIFFERENT SENSITIVITY OF S- AND D-ELECTRON ENERGY LEVELS TO A CHANGE IN LATTICE PARAMETERS IN TRANSITION METALS
O. A. Evdokimenko, O. T. Malyuchkov, I. S. Shpotin, and L. I.

Yastrebov 14 Jul. 1983 7 p refs Transl. into ENGLISH from Izv. (USSR), p 93-95
(BLL-M-35116-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A calculation was made of the zone energy structures of the typical transition atoms vanadium and chromium for different values of the lattice parameter (without self consistency). The results of the calculation are compared with those of self consistent calculations. It is concluded that nonself consistent calculation does not permit full account to be taken of the sensitivity of d-electrons to a change of potential in the outer region of the atom, and it does not properly transmit the relaxation of d-orbitals with a change in pressure. For transition metals with a change in pressure self consistent calculations (or calculations simulating them) are required. M.G.

N84-10997# British Library Lending Div., Boston Spa (England).
CALCULATION OF SHORT-RANGE-ORDER STRUCTURES IN Cu-14.5 PERCENT (ATOM.) A1
Yu. S. Stark and A. S. Shteinberg 14 Jul. 1983 8 p refs Transl. into ENGLISH from Izv. (USSR), p 90-93
(BLL-M-35115-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The Khachaturyan equation is used as the basis for a theoretical determination of short-range-order structures in a substitutional solid solution. The parameters of short-range order in the Cu-14.5% Al alloy are obtained with allowance for long-range oscillating mixing potential. Type-Cu3Au ordering was found to be a characteristics of regions of the alloy structure corresponding to calculated results, and this confirmed by experimental investigations. M.G.

N84-10998# British Library Lending Div., Boston Spa (England).
INTERACTION POTENTIALS IN SUBSTITUTIONAL SOLID SOLUTIONS
Yu. S. Stark and V. V. Borodai 14 Jul. 1983 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1982 p 156
(BLL-M-35132-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The correctness of theoretical calculation of the energies of ionic interaction in substitutional solid solutions is checked by comparing calculated values with experimental data obtained in an earlier work, where nuclear magnetic resonance tests were carried out to determine the gradients of electric fields in different coordination spheres around an impurity ion. Author

N84-10999# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF MOLECULAR-STRUCTURAL CHARACTERISTICS OF cis-1,4 POLYISOPRENE ON THE MELTING TEMPERATURE OF THE ORIENTATED CRYSTALINE PHASE
A. I. Marei 1982 8 p refs Transl. into ENGLISH from Kaucuk i Rezina (USSR), no. 1, 1981 p 13-15
(CSIR-Trans-1643) Avail: NTIS HC A02/MF A01

As is generally known, the melting temperature of the crystallized polymer phase is determined by the regularity and content of macromolecules, gel content nd function and molecular weight parameters, and the presence or absence of various admixtures. The simplest and most convenient method of studying the crystallization and melting of polymers is the mechanical and, particularly, the tension set method. This method was originally developed for investigating crystallized vulcanizates and was subsequently used for determining the crystallized rubber, i.e. under conditions exclusing plastic deformation. Author

N84-11000# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
THE RECIPROCAL INFLUENCE OF FUNCTIONAL GROUPS IN SUBSTITUTION REACTIONS ON THE DIAMOND SURFACE
S. K. Gordeev 1982 7 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (USSR), v. 262, no. 1, 1982 p 127-130
(CSIR-Trans-1685) Avail: NTIS HC A02/MF A01

The effect of different functional groups on various chemical characteristics at the diamond surface is considered with emphasis on the substitution reactions of the chlorofunctional groups. The investigation was carried out on ASM 0,5/0 and ASM 0,3/0 synthetic diamond submicropowder on the surface of which the chlorofunctional groups were synthesized to a concentration of 11.0 + or - 0.2 micromole sq m. The degree of substitution of chlorofunctional group was assessed on the basis of the quantity of hydrogen chloride evolved. Graphs show the relationship between reaction activation energy and the number of substituting chlorofunctional groups for three reactions as well as the distribution density of these groups on the diamond surface as a function of activation energy. A.R.H.

N84-11001# California Univ., Irvine. Dept. of Electrical Engineering.
THIN-FILM GUIDED-WAVE DEVICES FOR INTEGRATED/FIBER OPTIC SIGNAL PROCESSING AND COMMUNICATIONS Annual Scientific Report, 1 Oct. 1981 - 30 Nov. 1982
Chen S. Tsai 22 Apr. 1983 25 p refs
(Grant AF-AFOSR-0288-80; AF Proj. 2305)
(AD-A129582; AFOSR-83-0501TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

Integrated or Guided-Wave Optics is an emerging technology that has the ultimate potential of integrating miniature optical components such as laser light sources, modulators, switches, deflectors, lenses, prisms, and detectors in a common substrate. The resultant integrated optic circuits and subsystems are expected to have a number of advantages over the conventional bulk optical systems in certain areas of applications. Some of the advantages include smaller size and lighter weight, wider bandwidth, lesser electrical drive power requirement, greater signal accessibility, and integratability. The integrated optic circuits are also expected to possess advantages in stability, reliability, ruggedness, and ultimate cost. It has been recognized for some time that the most immediate applications of integrated optics lie in the areas of wideband multichannel communications and signal processing (for both civilian applications such as fiber optic systems and military hardwares such as sensors and radars). The general objectives of this research program are to study the basic physical mechanisms/phenomenon of new and novel guided-wave devices with application to wideband multichannel optical information processing. GRA

N84-11002# Universidad Autonoma de Madrid, Cantoblanco (Spain). Dept. de Fisica del Estado Solido.
ELECTRONIC PROPERTIES OF SEMICONDUCTOR INTERFACES Final Technical Report, Dec. 1981 - Feb. 1983
F. Flores, C. Tejedor, F. Guinea, and J. Sanchez-Dehesa Feb. 1983 102 p refs
(Contract DAJA37-82-C-0118; DA Proj. 1T1-61102-BH-57)
(AD-A130745) Avail: NTIS HC A06/MF A01 CSCL 20/12

The objective was to analyze the electronic properties of different emiconductor interfaces. The Wannier function formalism has been applied to the GaAs-AlAs (111) and (100) heterojunctions and superlattices. Ionic relaxations, band discontinuities and interface states have been obtained. Abrupt Si-metal interfaces and Si-interlayer-metal junctions have been analyzed by means of a selfconsistent tight-binding approach. The barrier height has been obtained by calculating the interface density of states and the neutral level of the junction. Our results show that the barrier height is mainly determined by the coupling between the semiconductor and the last layer just sitting on top of the same semiconductor. Author (GRA)

N84-11003# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
CHEMICALLY DERIVATIZED SEMICONDUCTOR PHOTOELECTRODES Interim Technical Report
Mark S. Wrighton 1 Jun. 1983 22 p refs Submitted for publication
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A130716; TR-37-ONR) Avail: NTIS HC A02/MF A01 CSCL

20/12

Semiconductor-based photoelectrochemical cells are the best man-contrived devices for the direct conversion of sunlight to electrical or chemical energy using chemically-based systems. Deliberate modification of the surface of the semiconductor photoelectrode is useful in improving the rate of desired processes and in suppressing undesirable anodic corrosion associated with photoanodes. Illustrations of the use of surface modification will be presented with specific examples coming from work with molecular-based derivatizing reagents and from the use of metals or metal oxides coated onto the photoelectrode surface.

Author (GRA)

N84-11004# Illinois Univ., Urbana. Dept. of Electrical Engineering.

HARMONIC GENERATION IN PARAMAGNETIC SPIN SYSTEMS Final Report, 1 Oct. 1981 - 1 Apr. 1983

M. R. Gurnick and T. A. DeTemple Jun. 1983 37 p refs

(Contract DAAG29-81-K-0175)

(AD-A130895; UILU-ENG-83-2545; ARO-18801.2-PH) Avail: NTIS HC A03/MF A01 CSCL 20/2

The theory of resonant second and third harmonic generation is considered and applied to the case of paramagnetic spin systems tuned by a magnetic field. Using available spectroscopic and material parameters, conversion efficiencies of around 25% seem feasible. Optical nonlinearities in semiconductor super-lattice are considered and shown to have large second order optical nonlinearities in the mid-infrared. Author (GRA)

N84-11005# Amorphous Materials, Inc., Garland, Tex.

LARGE PLATE CdTe SYNTHESIS BY SEALED VESSEL TRANSPORT Quarterly Report, 1 Apr. - 30 Jun. 1983

A. R. Hilton Jul. 1983 46 p refs

(Contract MDA903-82-C-0159)

(AD-A130947; AIM-012; QR-6) Avail: NTIS HC A03/MF A01 CSCL 20/2

The sixth quarterly technical report for the program to grow large plates of high purity CdTe in a sealed system covers the period April 1 - June 30, 1983. The process to grow 8 inches diameter plates of CdTe high in purity with large grain sizes has been developed. Evaluation results from other workers have conformed the purity and high resistivity of the resultant materials. Attempts to confirm optical homogeneity using an MTF test failed because of our inability to polish the material flat. A method for generating 2 inches diameter disks from the plates was developed. Results from the evaluation of 2 inches disks are presented. The first attempt to produce a 10 inches diameter plate was unsuccessful because of quartz failure. The efforts will be resumed next quarter. GRA

N84-11006# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

PHASE-SLIP CENTERS AND THEIR INTERACTIONS Interim Report

Juan M. Aponte Jun. 1983 123 p refs

(Contracts N00014-77-C-0085; N00014-75-C-0648; NSF DMR-79-04155)

(AD-A130914; TR-21) Avail: NTIS HC A06/MF A01 CSCL 20/3

The author performed a series of different experiments in order to measure the diffusion length of the quasiparticle charge generated in a phase-slip center (PSC) and to detect the oscillations of the supercurrent in the PSC. Three different types of samples were fabricated photolithographically: samples of type S, samples of type T and samples of type M. GRA

N84-11007# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

TRANSIENT RESPONSE OF SUPERCONDUCTING MICROBRIDGES TO SUPERCRITICAL CURRENTS Interim Report

David J. Frank Jun. 1983 165 p refs

(Contracts N00014-77-C-0085; N00014-75-C-0648; NSF DMR-79-04155)

(AD-A130913; TR-20) Avail: NTIS HC A08/MF A01 CSCL 20/3

We have made time-resolved measurements of the voltage waveforms on one-dimensional superconducting strips caused by current pulses in excess of their critical currents. We report the first known observations of the kinetic inductance spike the non-zero minimum voltage, and the time-domain development of phase-slip centers. These measurements were made on indium microbridges and represent an important extension of the work of Pals and Wolter to a higher critical temperature material. We have also measured the delay time between the application of the current pulse and the development of the first phase slip center in these bridges and have used it in conjunction with the SST theory (Schmidt, Schon and Tinkham 1980) to estimate a Tau sub E of 140 picoseconds for indium. In addition we have made a few measurements on dirty aluminum strips which also show the time domain development of phase slip centers. We have compare the data with the nonequilibrium superconductivity theory SST wherever possible. To do this, we have developed a computer program that approximation. From these numerical solutions we have found that, for the most part, the theory is in good agreement with the data. We have also used this exact solution to test the validity of several simpler approximations. GRA

N84-11008# Florida Univ., Gainesville. Dept. of Electrical Engineering.

STUDY OF DEEP-LEVEL DEFECTS AND TRANSPORT PROPERTIES VS. GROWTH PARAMETERS AND ANNEALING CONDITIONS IN III-IV COMPOUND SEMICONDUCTORS Annual Technical Report, 11 Jun. 1982 - 10 Jun. 1983

Sheng S. Li 10 Jun. 1983 111 p refs

(Grant AF-AFOSR-0187-81; AF Proj. 2306)

(AD-A130776; AFOSR-83-0630TR) Avail: NTIS HC A06/MF A01 CSCL 20/12

The objectives of this research program are: (1) To investigate the grown-in defects and the effects of thermal and laser annealing on the grown-in defects in LEC grown Zn-doped InP, (2) to study the transport properties in n-type InP, (3) to characterize the grown-in defects vs annealing temperature in the LEC grown GaAs, and compare the deep-level defects in the MOCVD grown GaAs on semi-insulating GaAs and Ge substrates, (4) to study the one-MeV electron radiation induced deep level defects in LPE grown GaAs and the effects of thermal annealing on these defects. Deep-level Transient Spectroscopy (DLTS) Capacitance-Voltage (C-V), Current-Voltage (I-V), Resistivity, and Hall effect measurements were employed to study the deep-level defects and transport properties vs growth parameters and annealing conditions in GaAs and InP specimens. Author (GRA)

N84-11009# Sandia Labs., Albuquerque, N. Mex.

CHARGE CHARACTERISTICS OF ION-IMPLANTED AND ANNEALED NITRIDE/OXIDE/SI STRUCTURES

Herman J. Stein 1983 14 p refs Presented at the 163d Electrochem. Soc. Meeting, San Francisco, 8 May 1983

(Contract DE-AC04-76DP-00789)

(DE83-012625; SAND-82-2788C; CONF-830508-18) Avail: NTIS HC A02/MF A01

The ability to select specific ions and ion energy with ion implantation was used in combination with capacitance voltage measurements to probe relationships between defects and net positive charge in silicon nitride. Silicon nitride films deposited onto (100) n-type Si at 8500C were implanted with (14)N() and (11)B(). Capacitance voltage measurements were made as a function of ion energy, thermal annealing, uv stimulated charge trapping and etchback to separate implanted ion and displacement damage effects on the implantation induced net positive charge. The data show implantation induced writing which is removed by heating to 5000 C. Effects produced by implantation induced defects are found to be ion independent but dependent upon ion energy which determines how close the displacement damage approaches the interface. The data for displacement damage effects are interpreted assuming hydrogen liberation from nitrogen

bonds in the displacement damage profile and subsequent motion of hydrogen toward the SiN/Si interface to form Si-H bonds. A calculational model is invoked to explain dominance of the near interface region on measured net charge. DOE

N84-11010# Sandia Labs., Albuquerque, N. Mex.
AXIAL-CHANNELING STUDIES OF STRAINED LAYER SUPERLATTICES
S. T. Picraux, L. R. Dawson, G. C. Osbourn, and W. K. Chu (North Carolina Univ., Chapel Hill) 1983 19 p refs Presented at 6th Intern. Conf. on Ion Beam Analysis, Temple, Ariz., 22 May 1983
(Contract DE-AC04-76DP-00789)
(DE83-013309; SAND-83-1194C; Conf-830570-4) Avail: NTIS HC A02/MF A01

Axial-channeling results are presented for the analysis of strained layer superlattices (SLS), a broad new class of semiconductor materials with adjustable electronic properties. In/sub x/Ga/sub 1-x/As/GaAs periodic layer structures grown by molecular beam epitaxy were analyzed by 2-MeV He-ion backscattering and channeling. Random spectra are used to obtain information on the layer thickness and composition. Channeled spectra and angular scans provide information on the lattice strain. The tetragonal distortions in the growth direction give rise to alternating tilts in inclined crystal rows at each interface. This results in significant dechanneling and narrowing of the angular scans along the [110] directions, but not along the [100] growth direction. Both the magnitude of the dechanneling with depth and the narrowing of the angular scans are directly related to the SIS lattice strain; theoretical calculations are required to determine the absolute magnitude of the strain. Results suggest the technique is sufficiently sensitive to detect lattice mismatches approx. = 0.2%, corresponding to lattice distortions of 0.01 A. DOE

N84-11011# Oak Ridge National Lab., Tenn. Solid State Div.
CALCULATIONS OF CHANNELING IN SEMICONDUCTOR SUPERLATTICES
J. H. Barrett 1983 11 p refs Seminar held at Chapel Hill, N.C., 21 Apr. 1983 Submitted for publication
(DE83-012040; DOE/NBM-3012040) Avail: NTIS HC A02/MF A01

Simulations were carried out to assess possible sources of dechanneling of 1 to 2 MeV He ions in InAs-GaSb superlattices. Results indicate that the sources are the strain and axis tilt produced by lattice constant mismatch between the two materials. DOE

N84-11012# Oak Ridge National Lab., Tenn.
MICROSTRUCTURE AND PROPERTIES OF TIB2 IMPLANTED WITH 1-MeV NICKEL
C. J. McHargue, P. S. Sklad, P. Angelini, and M. B. Lewis 1983 22 p refs Presented at 2nd Intern. Conf. on Radiation Effects in Insulators, Albuquerque, N. Mex., 30 May 1983
(Contract W-7405-eng-26)
(DE83-014020; CONF-830573-2) Avail: NTIS HC A02/MF A01

Polycrystalline samples of TiB2 were implanted at ambient temperatures with 1-Mev Ni( ) ions to a fluence of 1 x 10(17) ions/cm(2). This fluence corresponds to a calculated nickel to titanium ratio, within the half width of the ion distribution, of approxmately 0.12. Analytical electron microscopy was used to study the resultant microstructure. The starting microstructure was modified to a depth of approximately 750 nm, significantly deeper than the calculated peak in the deposited nickel profile of 389 nm. The results also show a change in the character of the microstructure, from on exhibiting a moderate ensity of tangled dislocations to a high density of small defects, as well as a change in the concentration of nickel as a function of depth from the implanted surface. There was no evidence of nickel precipitation. Surface mechanical properties such as hardness and wear resistance were significantly increased. DOE

N84-11013# Massachusetts Inst. of Tech., Cambridge.
SAFETY AND PROTECTION FOR LARGE-SCALE SUPERCONDUCTING MAGNETS. A FY 1982 REPORT
R. J. Thome, R. D. Pillsbury, Jr., Y. Iwasa, W. R. Mann, and W. G. Langton Oct. 1982 88 p refs
(Contract DE-AC02-78ET-51013)
(DE83-012961; DOE/ET-51013/81) Avail: NTIS HC A05/MF A01

The FY82 effort in safety and protection focused on tests and analyses in the following areas: (1) short circuit performance in the 30 T hybrid magnet, (2) arc voltage/current characteristics in simulated windings, (3) vapor-cooled lead burnout, (4) acoustic emission, and (5) joint MESA/MIT safety activity. DOE

N84-11014# Oak Ridge National Lab., Tenn. Solid State Div.
DOPANT INCORPORATION DURING NONEQUILIBRIUM SOLIDIFICATION
C. W. White 1983 12 p refs Presented at the 1st European Meeting on Laser-Solid Interactions and Transient Thermal Processing of Mater., Strasbourg, 25 May 1983
(Contract W-7405-eng-26)
(DE83-014052; CONF-83005102-1) Avail: NTIS HC A02/MF A01

Systematic studies of dopant incorporation into silicon during rapid solidification are reviewed, including measurements of interface temperatures and thermal gradients during solidification. Mechanisms limiting dopant incorporation at high concentrations are discussed. Melting of the surface of thin amorphous layers on a crystalline substrate is shown to take place at anomously low laser energy densities. DOE

N84-11015# University of Southern California, Los Angeles. Center for Laser Studies.
MULTIPLE-PULSE LASER-INDUCED DAMAGE IN CRYSTALINE AND FUSED QUARTZ Final Report
M. Bass 15 Jul. 1983 56 p refs
(Contract DE-AT03-81NE-33080)
(DE83-015458; DOE/NE-33080/T1) Avail: NTIS HC A04/MF A01

This report presents the major results of an exhaustive study of the failure properties of crystalline and fused quartz when irradiated with many pulses of laser light at wavelengths from 1064, to 350 nm. Data is presented which shows that the bulk damage threshold for single pulse irradiation varies little from one material to another and depends somewhat on the laser wavelength. On the other hand, the multiple pulse damage properties are highly dependent on material, laser wavelength, spot size, pulse duration and pulse repetition rate. These results and the statistics of the multiple pulse damage process show that it results from the accumulation of microscopic damage on each subcatastrophic damage threshold pulse. The repetition rate dependence shows that the microscopic damage has a lifetime of the order of tenths of a second, and this suggests that this sort of damage may be the result of transient color center formation. DOE

N84-11016# Sandia Labs., Albuquerque, N. Mex.
MONTE CARLO SIMULATION OF SHOCK-INDUCED LATTICE DAMAGE
Brian W. Dodson and Paul A. Taylor 1983 5 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-015189; SAND-83-0537C; CONF-830719-12) Avail: NTIS HC A02/MF A01

A new technique was developed, based on the Monte Carlo method, for simulation of the atomic scale effects of shock loading upon model systems. Metastable atomic configurations resulting from strain rates which are fast or slow relative to configurations resulting from strain rates which are fast or slow relative to configurational equilibration rates can be calculated. Using this technique to simulate uniaxial shock and quasi-static loading of 2-D argon, we find that the degree of defectiveness strongly depends upon the strain rate. This observation may help explain

the observed difference in chemical reactivity under quasi-static and shock loading. DOE

N84-11017# State Univ. of New York, Stony Brook. Research Foundation.
RESEARCH ON SURFACE PHYSICS AND CRYSTALLOGRAPHY AT NSLS Technical Progress, 1 Nov. 1982 - 31 Oct. 1983
1983 7 p refs
(Contract DE-AC02-80ER-10750)
(DE83-015035; DOE/ER-10750/T1) Avail: NTIS HC A02/MF A01

This report concerns research on surface physics and crystallography that was carried out at the National Synchrotron Light Source. The writer is a member of the participation research team (PRT) that operates beam line U7. The items presented in this report are: a list of the scientific papers produced during the current year and published or submitted for publication or presented at scientific meetings; a progress report on the operation of beam line U7 and of the uv ring; and a description of the scientific projects undertaken and of the results obtained. DOE

N84-11018# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
HIGH-RESOLUTION ELECTRON-MICROSCOPY STUDIES OF NATIVE OXIDE ON SILICON
J. H. Mazur, R. Gronsky, and J. Washburn Jun. 1983 19 p refs
(Contract DE-AC03-76SF-00098)
(DE83-014794; LBL-16272) Avail: NTIS HC A02/MF A01

High-resolution electron microscopy of cross-section specimens has shown that the thickness of the native oxide on silicon is 20 + or - 3A, independent of surface orientation. This result has confirmed the value 21 + or - 4A determined by ellipsometry assuming a stoichiometric SiO2 native oxide. Previous reports of a nonstoichiometric transition layer between Si and SiO2 containing an excess of 10(15) cm(+2) Si atoms have also been alternatively explained by the observed morphological features of the Si-SiO2 interface. DOE

N84-11019# Los Alamos Scientific Lab., N. Mex.
EVIDENCE FOR STACKING FAULTS IN MULTIAXIAL STRAINED ALPHA-BRASS
R. B. Roof 1983 9 p refs Presented at the Joint Meeting of Am. Cryst. Assoc. and Denver X-ray Conf., Snowmass, Colo., 1 Aug. 1983
(Contract W-7405-eng-36)
(DE83-014118; LA-UR-83-1724; CONF-830887-1) Avail: NTIS HC A02/MF A01

Two different techniques of X-ray diffraction were applied to the examination of multiaxial strained alpha-brass. From an examination of the unfolded Fourier coefficients describing the shape of the diffraction profile it was determined that the true crystallite size probably exceeds 2000 A, a practical upper limit for determining crystallite size by X-ray methods. The localized strain is approximately 0.225% and a combined stacking fault probability (1.5 (-) + (ALPHA) = 0.0185 or 1. From lattice constant variations the single stacking fault probability, (-) is prime, was determined to be 0.0054 + or - 22. The twinning stacking fault, (ALPHA), is thus 0.0104 + or - 22. The reciprocal of the probability is the number of planes of atoms between the indicated stacking fault. The magnitude of the numbers indicates that twinning is twice as common as single stacking faults. DOE

N84-11020# Cornell Univ., Ithaca, N.Y.
INELASTIC DEFORMATION OF CRYSTALINE NONMETALLIC SOLIDS Final Report, 1 Aug. 1977 - 30 Jun. 1983
David L. Kohlstedt Jun. 1983 190 p refs
(Contract DE-AC02-77ER-04441)
(DE83-014594; DOE/ER-04441/T2) Avail: NTIS HC A09/MF A01

For germanium, systematic changes in deformation behavior with increasing temperature, dopant level, and crystal orientation can be described in terms of a two-branch rheological model which describes both low temperature and high temperature mechanical response. Before deformation tests could be carried out on TiC-VC alloys, a reactive hot pressing technique had to be developed to prepare fully dense polycrystalline samples. Load relaxation experiments on TiC-VC alloys, as well as on single crystals of the parent carbides, demonstrates that deformation behavior is very systematic and can be described by a mechanical equation of state. DOE

N84-11021# Sandia Labs., Albuquerque, N. Mex.
PRESSURE STUDIES OF ORGANIC SUPERCONDUCTORS
J. E. Schirber, L. J. Azevedo, J. E. Kwak, E. M. Engler (International Business Machines Corp., San Jose, Calif.), and J. M. Williams (Argonne National Lab., Ill.) 1983 7 p refs Presented at the 9th AIRAPT Conf., Albany, N.Y., 25 Jul. 1983
(Contracts DEAC04-76DP-00789; W-31-109-eng-38)
(DE83-015344; SAND-83-1359C; CONF-830763-3) Avail: NTIS HC A02/MF A01

Pressure studies of the electronic properties of organic superconductors of the (TMTSF) 2X (X = PF6) family were very useful in answering some of the important questions key to the understanding of these materials. More work needs to be done to establish by either direct structure measurements (which will be extremely difficult) or by inference from careful microscopic probes, the structure (both crystal and electronic) in the temperature pressure magnetic field regimes of interest. Such information is necessary to complete the understanding of these materials necessary to permit intelligent tailoring of their properties. DOE

N84-11022# Loyola Univ., Chicago, Ill. Dept. of Physics.
EPR SPECTRA OF RARE EARTH S-STATE IONS IN GLASSY SYSTEMS
C. M. Brodbeck and L. E. Iton (Argonne National Lab., Ill.) Jun. 1983 2 p refs Presented at the 8th Intern. Soc. of Magnetic Resonance, Chicago, 22-26 Aug. 1983
(Contract W-31-109-eng-38)
(DE83-014686; CONF-830891-1) Avail: NTIS HC A02/MF A01

Although the X-band EPR spectra or Gd(3) and (Eu(2) ions in a wide variety of glassy systems exhibit recurring prominent features at g approx. = 5.9, 2.8 and 2.0, there is serious disagreement in the literature concerning the distribution of crystal field parameters b/sub k/q that can theoretically account for these features. A critical analysis of the glassy type sepctra was performed employing (a) a set of consistency criteria to determine if a given distribution of b/sub k/q is compatible with the full range of available experimental EPR and optical data, and (b) ab initio computer simulations of the EPR spectra. DOE

N84-11023*# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PERFORMANCE AND MATERIALS ASPECTS OF Ge:Be PHOTOCONDUCTORS
N. M. Haegel, E. E. Haller, and P. N. Luke Feb. 1983 12 p refs Presented at the 7th Intern. Conf. on Infrared and Millimeter Waves, Marseilles, 14-18 Feb. 1983
(NASA Order W-14606; Contract DE-AC03-76SF-00098)
(NASA-CR-174470; NAS 1.26:174470; DE83-014863; CONF-830235-1) Avail: NTIS HC A02/MF A01

Ge:Be photoconductors were developed for low photon background applications in the 30 to 50 (SIGMA)m wavelength region. These detectors provide higher responsivity and lower noise equivalent power (NEP) than the Ge:Ga detectors currently operating in this wavelength range. Beryllium doped single crystals were grown by the Czochralski method from a carbon susceptor under a vacuum of approx. 10(+6) torr. An optimum detective quantum efficiency of 46% at a background flux of 1.5 x 10(8) photons/second (7 x 10(+13) W) was reported. Ge:Be detector performance is strongly influenced by the absolute concentrations and the concentration ratio of residual shallow donors and shallow acceptors. DOE

N84-11024# Sandia Labs., Albuquerque, N. Mex.
MICROSTRUCTURES OF PULSE-MELTED Fe-Ti-C ALLOYS
D. M. Follstaedt, J. A. Knapp, and P. S. Peercy 1983 7 p refs

Presented at the 5th Intern. Conf. on Liquid and Amorphous Metals, Los Angeles, 15-19 Aug. 1983
(Contract DE-AC04-76DP-00789)
(DE83-015213; SAND-83-0790C; CONF-830888-3) Avail: NTIS HC A02/MF A01

Surface alloys (approx. 0.1 (SIGMA)m thick) were formed on Fe substrates by ion implantation. When both Ti and C were present in sufficient concentrations (ranging from approx. J at. % Ti with approx. 25 at. % C to approx. 20 at. % Ti with approx. 10 at. % C) the resulting surface alloy was amorphous. These amorphous alloys were heated with a short electron beam or laser pulse of sufficient energy to melt through the layer and into the Fe substrate. Heat flow calculations indicated that the molten layer rapidly resolidified (approx. 250 nsec) with quite high (10(9) to 10(1)0 K/s) cooling rates; however, the resolidified alloys were not amorphous, but were instead microcrystalline with TiC precipitates. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-11025# Marquette Univ., Milwaukee, Wis. Dept. of Mechanical Engineering.
PROPERTIES OF MERCURY-CADMIUM-TELLURIDE SOLID SOLUTIONS Final Report, 1 Jul. 1978 - 30 Jun. 1983
Robert F. Brebrick 30 Jun. 1983 11 p refs
(Grant AF-AFOSR-3611-78; AF Proj. 2306)
(AD-A130224; AFOSR-83-0585TR) Avail: NTIS HC A02/MF A01 CSCL 20/13

Measurements of the partial pressures in the mercury-cadmium-tellurium system are indicated. The thermodynamic analysis of this system is briefly sketched. References to detailed accounts of these results are cited. There now exist sufficient data that this system is to a large extent thermodynamically characterized. Moreover, a thermodynamic model has been established that allows a quantitative reproduction of essentially all of what appears to be the reliable phase diagram, partial pressure, and general thermodynamic data. Author (GRA)

N84-11026# California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering.
THE QUANTUM DYNAMICS OF CHEMICAL REACTIONS Final Scientific Report, 1 Jul. 1981 - 30 Jun. 1982
Aron Kuppermann 31 Mar. 1983 489 p refs
(Grant AF-AFOSR-0235-81; AF Proj. 2303)
(AD-A130160; AFOSR-83-0565TR) Avail: NTIS HC A21/MF A01 CSCL 20/10

In this project, we developed accurate and approximate methods for calculating cross sections of elementary reactions. These methods were applied to systems of importance for the fundamental aspects of chemical dynamics and for advanced technologies of interest to the United States Air Force. The application included calculations of three-atom exchange reactions, break-up and three-body recombination collisions and vibrational quenching by reaction. These calculations improved our understanding of such processes and permitted an assessment of some approximate methods. Author (GRA)

N84-11027# Purdue Univ., Lafayette, Ind. Lab. for Thermophysical Properties Research.
THERMOPHYSICAL PROPERTY DETERMINATION USING TRANSIENT TECHNIQUES Annual Report, 15 Feb. 1982 - 15 Feb. 1983
Raymond E. Taylor, Robert L. Shoemaker, Leslie G. Koshigoe, and John L. Stark 14 Apr. 1983 10 p refs
(Contract F49620-81-K-0011; AF Proj. 2308)
(AD-A130707; AFOSR-83-0605TR; TPRL-317) Avail: NTIS HC A02/MF A01 CSCL 20/13

In this program, determinations of the thermophysical properties of HMX, RDX and AP are being made. Two thermal properties are being measured: (1) specific heat and (2) thermal diffusivity. The product of these results and the densities of the propellants, yields the thermal conductivity of the material. Specific heat as a function of temperature for single crystals of HMX in both their beta and delta phases have been completed. Delta phase results were obtained using two techniques: (1) short range results from 477-486 degrees K just after the phase transition (beta to delta), and (2) extended range results from 415-485 degrees K. The second technique was possible due to hysteresis in the conversion of delta-HMX back to beta-hmx following cooling from above the phase transition temperature. The delta phase results for a powdered blend of HMX were obtained and yielded good agreement of the single crystals. Also, the specific heat of HMX inter-mixed with decomposition products was found to be slightly larger than for pure HMX. GRA

N84-11028# Florida Univ., Gainesville. Particle Theory Group.
AXIONS IN COSMOLOGY
P. Sikivie 1982 52 p refs Presented at the 21st Schladming Winter School, Paris, 1 Feb. 1982
(Contract DE-AS05-81ER-40008)
(DE83-015590; DOE/ER-40008/35; CONF-820283-1) Avail: NTIS HC A04/MF A01

Topics include the strong CP problem, the Peccei-Quinn mechanism and the axion, the vacuum structure of axion models and the period of theta, domain walls, solutions to and constraints from the domain wall problem, how many axions in the universe, and axions and galaxies. DOE

N84-11029# National Bureau of Standards, Washington, D.C. National Engineering Lab.
COMPUTER MODELING OF THE VAPOR COMPRESSION CYCLE WITH CONSTANT FLOW AREA EXPANSION DEVICE Final Report
Piotr Domanski and David Didion May 1983 163 p refs Sponsored in part by Department of Energy
(PB83-226639; NBS-BSS-155) Avail: NTIS HC A08/MF A01 CSCL 13M

An analysis of the vapor compression cycle and the main components of an air source heat pump during steady state operator was performed with emphasis on fundamental phenomena taking place between key locations in the refrigerant system. The basis of the general heat pump model formulation is the logic which links the analytical models of heat pump components together in a format requiring an iterative solution of refrigerant pressure, enthalpy and mass balances. The modeling effort emphasis was on the local thermodynamic phenomena which were described by fundamental heat transfer equations and equation of state relationships among material properties. GRA

N84-11030# National Bureau of Standards, Washington, D.C. National Engineering Lab.
COMPUTER MODELING OF THE VAPOR COMPRESSION CYCLE WITH CONSTANT FLOW AREA EXPANSION DEVICE: APPENDIX J Final Report
Piotr Dormanski and David Didion May 1983 103 p refs Sponsored in part by Department of Energy
(PB83-226647; NBS-BSS-155-App-J) Avail: NTIS HC A06/MF A01 CSCL 13M

The modeling effort emphasis was on the local thermodynamic phenomena which were described by fundamental heat transfer equations and equation of state relationships among material properties. In the compressor model several refrigerant locations were identified and the processes taking place between these locations accounted for all significant heat and pressure losses. Evaporator and condenser models were developed on a tube by tube basis where performance of each coil tube is computed separately by considering the cross flow heat transfer with the external air stream and the appropriate heat and mass transfer

relationships. A capillary tube model was formulated with the aid of Fanino flow theory. GRA

N84-11031# Texas A&M Univ., College Station. Chemical Engineering Dept.
THERMODYNAMIC PROPERTIES FOR NATURAL GAS BINARIES Annual Report, 1 Jan. - 31 Dec. 1982
Kenneth R. Hall, Phillip T. Eubank, and James C. Holste Jan. 1983 18 p refs Sponsored by Gas Research Inst.
(PB83-228403; GRI-82/0043) Avail: NTIS HC A02/MF A01 CSCL 07D

A set of data covering PVT, enthalpy and liquid/vapor equilibrium for binary systems composed of natural gas components is supplied. Burnett-coupled isochoric data can provide all this information with extreme accuraccy and precision over wide ranges of temperature and pressure. An existing apparatus and a new apparatus to collect these data were modified and constructed. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-11032# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
USAF/SCEEE SUMMARY FACULTY RESEARCH PROGRAM, RESEARCH REPORTS, VOLUME 1 Final Report
Warren D. Peele and Earl I. Steele Oct. 1982 933 p refs 2 Vol.
(Contract F49620-82-C-0035; AF Proj. 2301)
(AD-A130789; AFOSR-83-0613TR) Avail: NTIS HC A99/MF A01 CSCL 05/1

The United States Air Force Summer Faculty Research Program (USAF-SFRP) is a program designed to introduce university, college, and technical institute faculty members to Air Force research. This is accomplished by faculty competition on a nationally advertised competitive basis for a ten-week assignment during the summer intersession to perform research at Air Force laboratories/centers. Each assignment is in a subject area and at an Air Force facility mutually agreed upon by the faculty member and the Air Force. In addition to compensation and travel expenses, a cost of living allowance is also paid. The USAF-SFRP is sponsored by the Air Force Office of Scientific Research/Air Force Systems Command, United States Air Force, and is conducted by the Southeastern Center for Electrical Engineering Education (SCEEE). Author (GRA)

N84-11033# Texas Univ., Austin. Dept. of Computer Sciences.
COGNITIVE PROCESSES AND KNOWLEDGE STRUCTURES USED IN SOLVING PHYSICS PROBLEMS Final Technical Report
Gordon S. Novak, Jr. 8 Dec. 1982 161 p refs
(Grant NSF SED-79-12803)
(PB83-225177) Avail: NTIS HC A08/MF A01 CSCL 05I

Understanding of cognitive processes and knowledge structures can enable computer programs to be written which can solve problems in physics and related technical domains automatically, without requiring that users of such programs be expert in physics. Such understanding can enable more effective teaching of physics, since the component proceses of physics problem solving are made explicit. It can provide the basis for intelligent computer-aided construction programs with understand the problem solving process, can answer questions about solutions of example problems, and can analyze failures in student problem solving. Knowledge representation, problem analysis, and machine learning of problem solving expertise are considered. GRA

N84-11034# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SCIENCE AND TECHNOLOGY POLICY, NO. 18
6 Oct. 1983 82 p Transl. into ENGLISH from various Russian articles
(JPRS-84484) Avail: NTIS HC A05

This serial report contains news items, abstracts and articles of scientific reports on aspects of science and technology policy including technology transfer, patents, inventions, academic research, and technical cooperation. For individual titles, see N84-11035 through N84-11045.

N84-11035# Joint Publications Research Service, Arlington, Va.
THE SOCIALIST AND DEVELOPING COUNTRIES: TECHNOLOGY TRANSFER c85
Stanislav Simanovsky *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 1-15 Transl. into ENGLISH from Foreign Trade (USSR), no. 3, (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 Mar. 1983 p 28-35

The transfer of technology as a basic means accelerating industrialization in the developing countries has extended beyond the framework of the specific problems; it now reflects the essence and character of relations between the industrialized countries and the newly independent nations. Elaboration of an agreed new organizational basis for the technology transfer to the developing countries and for improving its economic mechanism with due regard for the interests of all its participants is one of the urgent tasks for restructuring international economic relations and establishing a new international ecnomic order. Author

N84-11036# Joint Publications Research Service, Arlington, Va.
SCIENTIFIC, TECHNICAL COOPERATION AMONG CEMA MEMBER-COUNTRIES URGED
Yuriy Shiryayev and Aleksandr Anchiskhin *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 16-22 Transl. into ENGLISH from Ekonomicheskoy Sotrudnichestvo Stran-Chlenov (USSR), no. 4, Apr. 1983 p 17-20 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

The most important thrust of the economic strategy is to ensure the growth of end-result production output with the least possible expenditures of material, financial, and labor resources along with the most efficient utilization of the existing production and scientific-technical potential. In order to intensify the economy and increase its effectiveness, a speed-up of scientific-technical progress, together with a broad-based and rapid introduction into production of the achievements of science, technology, and advanced experience must be attained. An important role herein is played by deepening the conradely cooperation and socialist mutual aid among the fraternal countries, their joint solution of scientific-technical, production, transportation, power-engineering, and other problems. Further steps are now being planned on this level within the CEMA member-countries and organs. Author

N84-11037# Joint Publications Research Service, Arlington, Va.
STRONGER UNION OF SCIENCE AND INDUSTRY DEMANDED c81
B. Paton *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 23-2 Transl. into ENGLISH from Partinaya Zhizn (USSR), no. 11, (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 Jun. 1983 7 p

Science is the basic foundation of scientific and technical progress. Under present conditions, its role in conversion of the country's economy to the path of intensive development and improvement of the economic mechanism is very great. Nevertheless science as a direct productive force can and must bear a greater role in the solution of key national economic questions. A demanding need exists for the further growth of effectiveness of scientific research and the soonest possible embodiment of it into a practical result. Scientists have enriched both the country and world science with significant achievements in the most diverse spheres of knowledge. Their are efforts concentrated on the most important directions of scientific-technical and social progress; research that opens up essentially new means and opportunities for the transformation of the cuntry's productive efforts and creation of equipment and technology of the future are developed and in

every possible way cooperation with production collectives is strengthened. Author

N84-11038# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS NOTED IN PATENT INFORMATION SYSTEM FOR CEMA MEMBER-COUNTRIES c82
Lotar Nikht *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 30-38 Transl. into ENGLISH from Ekonomicheskoye Sotrudnichestvo Stran Chlenov (USSR), no. 4, Apr. 1983 p 23-26 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

Under the present day conditions whereby the countries of the socialist community are making the transition to a predominantly intensive path of technical progress has become increasingly important. Therefore, in carrying out socialist economic integration there is an enhanced role to be played by scientific-technical coopertion among the CEMA member-countries. One of its important links is coperation in the field of inventions and patents, since only equipment created on the bsis of inventions is capable of revolutionizing production and yielding maximum econiomic effects. Author

N84-11039# Joint Publications Research Service, Arlington, Va.
ORGANIZATIONAL IMPROVEMENTS IN CEMA SCIENTIFIC, TECHNICAL COOPERATION SOUGHT c81
Vladimir Leontev *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 39-43 Transl. into ENGLISH from Ekonomicheskoye Sotrudnichestvo Stran Chlenov (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 (USSR), no. 4, Apr. 1983 p 20-22

Scientific-technical cooperation among the CEMA member-countries has the following goals: Unification of the efforts of engineers and scientists and concentration of the resources of the fraternal countries for achieving the maximum reslts with regard to the problems of mutual interest, in particular, with regard to working out the introducing into production competitive models of machinery and equipment, along with technology new in principle; creation of a mutually coordinated scientific-technical potential; and development on the basis of the achievements of science and technology in the countries involved an international specialization and cooperation in production. Author

N84-11040# Joint Publications Research Service, Arlington, Va.
PRAVDA ARTICLE ON INVENTIONS ELICITS RESPONSE c81
A. Glovatskiy *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 44-47 Transl. into ENGLISH from Pravda (USSR), 27 Apr. 1983 p 3 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

The article by A. Glovatskiy 'Application Was Submitted...' (PRAVDA 17 November 1982) evoked a big response. Five months passed and the editorial board is still receiving comments. The authors of most of them approve the article either unreservedly, or in principle, disputing some points and advancing counterpoints. Yes, the practical recommendations made were received by readers by no means unanimously. All the colors of the 'rainbow' - from enthusiastic support to radical denial - are here. A detailed examination of their merits and demerits is more appropriate on pages of publications specializing in problems of inventions. Author

N84-11041# Joint Publications Research Service, Arlington, Va.
IMPROVED MANAGEMENT OF SCIENTIFIC PROGRESS IN ARMENIA URGED c81
A. Agababov *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 48-51 Transl. into ENGLISH from Kommunist (USSR), 2 Apr. 1983 p 2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

The beginning of the third year of the 11th Five-Year Plan was marked by events of tremendous importance. The decisions of the November (1982) Plenum produced a nationwide movement for the maximum possible strengthening of labor and state discipline and for an increase in the responsibility for a full implementation of national economic plans - performance and state discipline. Significant advances in national economic development were in the last 2 years. The gross national product increased by more than 11 percent, the natinal income, by 12.1 percent and the volume of industrial production, by 12 percent. What was achieved is the result of the planned introduction of the achievements of science and technology into national economic sectors. More than 1,400 key measures for new technology, including 115, for the mastering of new types of industrial products, 428, for advanced techniques and mechanization and automation of production, 225, for a rise in the technical and economic level of production, 320, for scientific labor organization and others were introduced in the last 2 years. Author

N84-11042# Joint Publications Research Service, Arlington, Va.
LACK OF SUPPORT FOR INTRODUCTION OF SOVIET INVENTIONS SCORED c81
L. Levitskiy *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 52-55 Transl. into ENGLISH from Izvestiya (USSR), 1 Jul. 1983 p 3 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

The need for equipment and inventions to be transfer to industrial uses is stressed. The failure of industry and scientific research to merge is a problem to the economic development within the country. Stress was placed on the solution to industrial problems by scientific endeavor. B.G.

N84-11043# Joint Publications Research Service, Arlington, Va.
SIXTH ALL-UNION CONGRESS OF INVENTORS HELD c81
In its USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 56-65 Transl. into ENGLISH from Trud (USSR), 26 May 1983 p 1-2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

Vast opportunities for scientific and technical creativity are afforded to the working people of our country. The army of millions of innovators is making its own weighty contribution to the fulfillment of the decisions of the 26th CPSU Congress. The broad expansion of scientific and technical progress and the mass mobilization of direct participants in production for creative exploration are actively promoted by the All-Union Society of Inventors and Rationalizers [VOIR]. Currently it has a membership of nearly 23 million production pace-setters, experts and scientists. Author

N84-11044# Joint Publications Research Service, Arlington, Va.
APPLICATIONS OF ACADEMIC RESEARCH NEGLECTED BY INDUSTRY
V. Fedyakin *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 66-69 Transl. into ENGLISH from Sov. Rossiya (USSR), 20 Apr. 1983 p 2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

The transfer of scientific research to industrial problems often does not happen. Methods to use the research meet with resistance, and so the benefit is lost. Methods of overcoming this difficulty must be found by cooperation of science and industry. Author

N84-11045# Joint Publications Research Service, Arlington, Va.
SCIENCE AND TECHNOLOGY PROGRAMS DISCUSSED c81
V. Polunin *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 70-73 Transl. into ENGLISH from Moskovskaya Pravda (USSR), 9 Jun. 1983 p 2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

An effective means of uniting science with production and pursuing a unified scientific policy is afforded by the state scientific-technical programs developed on the decision of the 26th CPSU Congress by the USSR State Committee for Science and Technology (GNTK), the USSR Gosplan, the USSR Academy of Sciences imposed task of combining the achievements of the scientific and technical revolution with the advantages of socialism.

These programs serve to exploit latent scientific and technical potential on a planned basis and on the scale of the entire country. These programs encompass a vast range of research and development work and provide for its speediest possible application primarily in the fuel-energy and agrarian-industrial complexes, machine building, metallurgy, instrumentmaking, chemical industry, transport, public health and consumer goods production. Economists have calculated that the implementation of the state scientific-technical programs will serve to save 4 million tons of ferrous metal, 50 million tons of standard fuel and 14 billion kwh of electrical energy. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-11046*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL HIGHLIGHTS, 1981
Nov. 1981 131 p Original contains color illustrations
(NASA-CR-174535; NAS 1.26:174535) Avail: NTIS HC A07/MF A01 CSCL 05A

Deep space exploration, energy and energy conversion technology, Earth orbital applications, information systems and space technology development, and technology applications are discussed. Author

N84-11047# Naval Ocean Systems Center, San Diego, Calif. Test and Monitoring Systems Office.
ON-LINE MONITORING GUIDE FOR TECHNICAL PERSONNEL Final Report
A. C. MacMurray and V. C. Leonard 7 Mar. 1983 28 p
(AD-A131044; NOSC-TD-579) Avail: NTIS HC A03/MF A01 CSCL 05/1

This technical document is envisioned as helpful to contractors for projection and anticipation of system design requirements that pertain to the on-line determination of a system's state-of-health during operation. The desired end product is to provide prime systems with optimum operational, maintenance, and repair capability within the bounds of the technical capability of assigned personnel, at the lowest possible life cycle cost. The information in this document is broken down into monitoring hardware/software sections. It is applicable to various levels and types of systems. This document begins with PM(Performance Monitoring) design selection and parameters, and covers various PM architectures and trade-offs. Next are components such as analog and electrical sensors, as well as computers and memory monitoring. The last section covers levels of interface along with coupling and shielding. GRA

N84-11048# Department of Defense, Washington, D. C.
BOTTOM LINE ACADEMIA CONFERENCE Final Report
24 Jun. 1983 105 p Conf. held at Washington, D.C., 28 Apr. 1983
(AD-A131043) Avail: NTIS HC A06/MF A01 CSCL 05/1

Initatives which the academic community culd take to meet industry and DoD needs for the improved application and management of the quality functions are explored. The necessity of improving the image of quality in industry for both competitive and economic reasons, thus assuring the readiness of defense forces is highlighted. The role academia could play in restructuring curricula include more quality management courses in preparing future industrial leaders are discussed as being the possible catalyst in returning America to the forefront in quality. J.M.S.

N84-11049# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.
THE COST GROWTH PROBLEM: A REALISTIC DIAGNOSIS AND SOLUTION M.S. Thesis
Robert David Aaron Jun. 1983 137 p refs
(AD-A131082; NPS54-83-006) Avail: NTIS HC A07/MF A01 CSCL 14/1

The problem of cost growth of major systems acquisitions has long been an importance concern within the Department of Defense (DOD) and Congress. A brief review of acquisition history from the 40's to the present shows little success in controlling it. With so many unsuccessful past changes to the organization and processes, the cost growth problem begs for a new approach. A review of the static principles of organizational design reveals several inconsistencies when compared to the DOD structure. The science of organizational development (OD) is discussed and recommended as a solution. Author (GRA)

N84-11050# SRI International Corp., Menlo Park, Calif.
A COMPARATIVE EVALUATION OF QUANTITATIVE DECISION-MAKING APPROACHES Executive Summary
M. W. Merkhofer Apr. 1983 10 p
(Grant NSF PRA-80-07238)
(PB83-214106; NSF/PRA-83015) Avail: NTIS HC A02/MF A01 CSCL 05A

The nature of the social risk management problem is explorer and possible solutions to the problem are offered. The question of whether or not the government should requlate in the face of increasing public concern over technological risks is addressed. It is determined that government could act to modify the hazard, the process by which individuals are exposed to the hazard, the process by which exposure produces adverse effects, or the valuation of those effects. The court's role in risk management is addressed. Various decision-making approaches are compared, including applied social welfare theory, decision-maker cost-benefit analysis, and supra decision-maker decision analysis. GRA

N84-11051# SRI International Corp., Menlo Park, Calif.
A COMPARATIVE EVALUATION OF QUANTITATIVE DECISION-MAKING APPROACHES Final Report
M. W. Merkhofer Apr. 1983 165 p refs
(Grant NSF PRA-80-07238)
(PB83-214114; NSF/PRA-83014) Avail: NTIS HC A08/MF A01 CSCL 05A

Research undertaken to support the selection of a quantitative decision-making approach to a risk management problem is described. Risk is defined, and the character of risks and the processes by which risks are generated are examined. The role of government in risk management is addressed and arguments in favor of government regulation are offered. A taxonomy is proposed for characterizing risk problems and examples are supplied for each of the characteristics. Alternative decision-making approaches are suggested for supporting government decisions involving risk. Criticisms direct at formal decision-making approaches are considered. Various decision-making aproaches are evaluated. GRA

N84-11052# National Science Foundation, Washington, D.C. Div. of Policy Research and Analysis.
PAPERS FOR AND A SUMMARY OF A WORKSHOP ON THE ROLE OF BASIC RESEARCH IN SCIENCE AND TECHNOLOGY: CASE STUDIES IN ENERGY R AND D (RESEARCH AND DEVELOPMENT)
1983 266 p Workshop held in Washington, D.C., 12-13 Mar. 1983
(PB83-213637; NSF-83-29; NSF/PRA-83013) Avail: NTIS HC A12/MF A01 CSCL 05A

Six papers are pesented that assess both the direct impact of basic research on the advancement of energy science and technology and the indirect benefits of that reseach to society. The various research areas of the Department of Energy's Basic Energy Science Program are described and a set of criteria is presented for use in allocating the limited resources available for basic energy research funding. Distinctions are drawn between basic and appplied research in industry. It is pointed out that basic energy research tends to be carried out in large, centralized laboratories within organizations that are themselves large, diversified, and multinational. The effects of the economy on

near-and medium-term research and development (R&D) programs are examined. Author (GRA)

N84-11053# Puerto Rico Univ., Mayaguez.
MICROCOMPUTERS: A TOOL FOR PLANNING AND SCHEDULING CONSTRUCTION PROJECTS
Jose F. Lluch Garcia Aug. 1982 24 p refs Presented at the 5th Pan Am. Congr. on Econ. and Cost Engr., San Juan, 1-7 Aug. 1982
(PB83-211201) Avail: NTIS HC A02/MF A01 CSCL 05A

The availability of low cost microcomputers, which are small in size and large in computing capacity, make computer based techniques for planning scheduling, and control of construction projects accessible to construction contractors. A prototype microcomputer implementation of CPM (Critical Path Method) and a full CYCLONE (Cyclic Operations Network) are presented. The CPM implementation is based on precedence networks. It supports many features of CPM programs found in large computers. CYCLONE is a method for the analysis of construction operations. It focuses on how, rather than when, to carry out a construction operation. The CPM and CYCLONE systems discussed are implemented on the TRS-80 and Commodore microcomputers. Author (GRA)

N84-11054# Social Security Administration, Baltimore, Md. Software Technology and Engineering Center Staff.
PRODUCTIVITY MEASUREMENT IN SOFTWARE ENGINEERING Final Report
Bruce R. Brown, Helen Herlich, Mary D. Emerson, Carroll L. Williamson, and Michael V. Greco 1 Jun. 1983 63 p refs
(PB83-227330; SSA/STECS/PROD-83/1) Avail: NTIS HC A04/MF A01 CSCL 05I

Productivity measurement is useful as a tool for determining why certain projects or organizations are more productive and for tracking organizational productivity over a period of time. The factors of people, project, and software engineering environment are the main elements which affect productivity. A number of measures for functional software systems are discussed. The two most important are function points and Halsteads's software science. Human resources are measured via a time collection methodology. Trends for ongoing and future research are also discussed. Estimation models using productivity measuement, additional functional software system measures, quality measures, and the exchange of productivity measurement information with private industry are included. An extensive list of references is supplied. GRA

N84-11055# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 88, NUMBER 1, JANUARY - FEBRUARY 1983 Bimonthly Report
Feb. 1983 95 p refs
(PB83-226704; LCCCN-63-37059) Avail: NTIS HC A05/MF A01 CSCL 05A

Contents: Estimation of parameters in models for cesium beam atomic clocks; Estimating time from atomic clocks; Measurement assurance program transmittance standards for spectrophotomter linearity testing-preparation and calibration; Statistical analysis of some gas chromatography measurements. GRA

N84-11056# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS. VOLUME 87, NUMBER 6, NOVEMBER-DECEMBER 1982 Bimonthly Report
Dec. 1982 86 p refs
(PB83-226670; LC-62-37059) Avail: NTIS HC A05/MF A01 CSCL 05A

Contents: Acceptance probabilities for a sampling procedure based on the mean and an order statistic, Mathematical analysis for radiomatric calorimetry of a radiating sphere. GRA

N84-11057# National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
ACADEMIC SCIENCE/ENGINEERING: R AND D FUNDS, FISCAL YEAR 1981(DETAILED STATISTICAL TABLES) Annual Report
Jun. 1983 155 p
(PB83-226213; NSF-83-308) Avail: NTIS HC A08/MF A01 CSCL 05A

Tabular data are presenedon 563 institutions of higher education regarding scientific and engineering (S/E) R&D expenditures at are separately budgeted. Data are the product of the National Science Foundation's annual Survey of Scientific and Engineering Expenditures at Universitis and Colleges, FY 1981. Data are tabulated by: (1) source of funds; (2) S/E disciplines; (3) character of work; (4) cntrol of institution (public/private); (5) largest performers; ranking; (6) highest degree offered; (7) total and federally financed current fund research equipment; and (8) capital expenditures for facilities and equipment for research, development, and instruction. Trend tables are included. The methodology and response rate are described and a reproduction of the survey; instrument is included. GRA

N84-10355# Joint Publications Research Service, Arlington, Va.
SOVIET ECONOMIST DISCUSSES EFFICIENT USE OF SCIENTIFIC POTENTIAL
G. Lakhtin *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 47-50 Transl. into ENGLISH from Pravda (Moscow), 4 Jul. 1983 p 7 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

N84-10358# Joint Publications Research Service, Arlington, Va.
ACCELERATION OF S&T PROGRESS DISCUSSED
M. Zaripov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 61-65 Transl. into ENGLISH from Sov. Rossiya (Moscow), 18 May 1983 p 2 (For primary document see N84-10348 01-31)
Avail: NTIS HC A06

N84-10360# Joint Publications Research Service, Arlington, Va.
IMPROVED PLANNING FOR LOCAL TERRITORIAL UNITS URGED
L. Barminskiy *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 76-83 Transl. into ENGLISH from Kommun. Belorussii (Minsk), no. 4, Apr. 1983 p 73-79 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

N84-10362# Joint Publications Research Service, Arlington, Va.
SCIENTIFIC-PRODUCTION COMPLEXES ORGANIZED IN GEORGIA
Zakhariy Papava *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 88-91 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), 30 Mar. 1982 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

N84-10363# Joint Publications Research Service, Arlington, Va.
CONTRIBUTIONS OF ACADEMIC INSTITUTES TO EFFECTIVENESS OF NEW TECHNOLOGY IN THE GEORGIAN SSR
Ilya Rubinshtein *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 92-96 Transl. into ENGLISH from Zarya Vostoka (Tbilisi), 10 Mar. 1983 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

N84-10365# Joint Publications Research Service, Arlington, Va.
UZBEK SCIENTIFIC INTELLIGENTSIA UNDER DEVELOPED SOCIALISM
N. Mutalov *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 101-108 refs Transl. into ENGLISH from Obshchestvennyye Nauki v Uzbekistane (Tashkent), no. 2, Feb. 1983 p 14-19 (For primary document see N84-10348 01-31)
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N84-11037# Joint Publications Research Service, Arlington, Va.
STRONGER UNION OF SCIENCE AND INDUSTRY DEMANDED

B. Paton *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 23-2 Transl. into ENGLISH from Partinaya Zhizn (USSR), no. 11, (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 Jun. 1983 7 p

N84-11039# Joint Publications Research Service, Arlington, Va.
ORGANIZATIONAL IMPROVEMENTS IN CEMA SCIENTIFIC, TECHNICAL COOPERATION SOUGHT
Vladimir Leontev *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 39-43 Transl. into ENGLISH from Ekonomicheskoye Sotrudnichestvo Stran Chlenov (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 (USSR), no. 4, Apr. 1983 p 20-22

N84-11040# Joint Publications Research Service, Arlington, Va.
PRAVDA ARTICLE ON INVENTIONS ELICITS RESPONSE
A. Glovatskiy *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 44-47 Transl. into ENGLISH from Pravda (USSR), 27 Apr. 1983 p 3 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

N84-11041# Joint Publications Research Service, Arlington, Va.
IMPROVED MANAGEMENT OF SCIENTIFIC PROGRESS IN ARMENIA URGED
A. Agababov *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 48-51 Transl. into ENGLISH from Kommunist (USSR), 2 Apr. 1983 p 2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

N84-11042# Joint Publications Research Service, Arlington, Va.
LACK OF SUPPORT FOR INTRODUCTION OF SOVIET INVENTIONS SCORED
L. Levitskiy *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 52-55 Transl. into ENGLISH from Izvestiya (USSR), 1 Jul. 1983 p 3 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

N84-11043# Joint Publications Research Service, Arlington, Va.
SIXTH ALL-UNION CONGRESS OF INVENTORS HELD
In its USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 56-65 Transl. into ENGLISH from Trud (USSR), 26 May 1983 p 1-2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

N84-11045# Joint Publications Research Service, Arlington, Va.
SCIENCE AND TECHNOLOGY PROGRAMS DISCUSSED
V. Polunin *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 70-73 Transl. into ENGLISH from Moskovskaya Pravda (USSR), 9 Jun. 1983 p 2 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-11058# Corps of Engineers, Chicago, Ill. Administrative Services.
THE TOTAL LIBRARY SYSTEM (TLS). VOLUME 1: WHAT IT CAN DO FOR YOU Final Report
W. Richard Schneider 1983 24 p refs
(AD-A130336) Avail: NTIS HC A02/MF A01 CSCL 05/2

This report is the first of a series describing the use of the Boeing EKS1 system in library automation at the library of the U.S. Army Corps of Engineers. North Central Division in Chicago, Illinois. This volume describes the beginnings of computers in libraries, why and how the TOTAL LIBRARY System was originated, the philosophy of file organization, changes in the library, and the advantages of using the TOTAL LIBRARY SYSTEM. Author (GRA)

N84-11059# Henderson (Madeline M.), Bethesda, Md.
COMPILATION OF COOPERATIVE DATA ELEMENT DICTIONARY OF FIVE FEDERAL AGENCIES' SYSTEMS FOR PROCESSING OF TECHNICAL REPORT LITERATURE
Madeline M. Henderson 1 Mar. 1983 78 p
(AD-A130797) Avail: NTIS HC A05/MF A01 CSCL 05/2

The data element dictionary project consisted of the compilation of a dictionary encompassing all of the data elements used in the major systems for handling technical reports; the systems involved are those of the Department of Defense Technical Information Center (DTIC), Department of Energy Technical Information Center (DOE/TIC), the National Aeronautics and Space Administration Scientific and Technical Information Facility (NASA/STIF), the National Technical Information Service (NTIS), and the Government Printing Office (GPO). All those elements, both substantive and housekeeping types, used in processing technical reports in each system are included in the compilation; each record contains the element's definition, rules for use, the tags or indicators used internally, and those used externally for information interchange. Author (GRA)

N84-11060# California Univ., Livermore. Lawrence Livermore Lab.
TIS (TECHNOLOGY INFORMATION SYSTEM): A FOCAL POINT FOR TECHNOLOGY TRANSFER
V. E. Hampel, J. B. Cain, R. A. Kawin, G. Pavel, and N. A. Lann Sep. 1982 24 p refs
(AD-A130798; UCRL-53342) Avail: NTIS HC A02/MF A01 CSCL 09/2

Lawrence Livermore National Laboratory (LLNL) is using the Technology Information System (TIS) to establish a focal point for technology transfer in support of its Office of Research and Technology Applications (LLNL/ORTA). TIS is slated to become the computer-based reference point for the identification of LLNL programs available for transfer to the public domain, as well as an effective means for communicating with the respective offices of other federal agencies: the Federal Laboratory Consortium (FLC), the Technology Transfer Society (T2), the NASA Industrial Applications Centers, and a selected number of state and local offices. TIS is used for the creation, report generation, and graphic display of descriptive and numeric data files, the execution of interactive models calculating the performance of electric vehicles, electronic mail, interconnection to electronic word processors and typesetters, and nationwide networking. The system is fully self-guided, which also permits those without computer experience to search, extract, and post-process relevant information in a productive and timely manner. This type of analysis can be used to identify the status and direction of ongoing government-supported research and development (R&D) and to increase industrial productivity by technology transfer. Author (GRA)

N84-11061# King Research, Inc., Rockville, Md.
THE USE AND VALUE OF DEFENSE TECHNICAL INFORMATION CENTER PRODUCTS AND SERVICES
Nancy K. Roderer, Donald W. King, and Sandra E. Brouard Jun. 1983 115 p
(AD-A130805) Avail: NTIS HC A06/MF A01 CSCL 05/2

This study describes the use and value of the major information products and services provided by the Defense Technical Information Center (DTIC). The products and services considered include technical report distribution on an on demand-basis and through the Automatic Document Distribution (ADD) program; secondary information dissemination through online searching of the Technical Reports (TR) data base, Current Awareness Bibliographies (CAB), and Technical Abstract Bulletins (TAB); and provision of management information from three management data banks. The amount

and kinds of use of each of these products and services is addressed, as is the value associated with use. GRA

N84-11062# California Univ., Livermore. Lawrence Livermore Lab.
DOWNLOADING AND POST-PROCESSING OF BIBLIOGRAPHIC INFORMATION WITH THE TIS (TECHNOLOGY INFORMATION SYSTEM) INTELLIGENT GATEWAY COMPUTER
Isom Harrison, Jr., Viktor E. Hampel, and Richard A. Kawin 9 Sep. 1982 10 p refs
(Contract W-7405-eng-48)
(AD-A130800; UCRL-88119) Avail: NTIS HC A02/MF A01 CSCL 05/2

The TIS Intelligent Gateway Computer at the Lawrence Livermore National Laboratory provides authorized users automated access to other information centers, downloading of descriptive information and numerical data, and post-processing of bibliographic citations. Included is the aggregation of extracted information into topical files, the elimination of redundancy, and online review for the creation of annotated relevant sets. Post-processing of the reviewed information can be carried out by permutation of titles, abstracts, and descriptors with statistics (some in graphical form) of their single/multi-term expressions, statistical cross-correlation of data elements, and the creation of concordances and indexes. These tools give new insight into a subject matter or the characteristics of corporate/personal publications. These self-guided procedures can be performed online from remote terminals by telephone dial-up, WATS-lines, over TYMNET, and via the ARPA computer network. The TIS Intelligent Gateway Computer permits the linking of terminals among users. Information specialists and information requestors may jointly view and discuss the progress of an interactive search and its analysis from any location. Uncertain legal constraints by commercial information vendors limit the use of downloading and post-processing at this time to bibliographical information in the public domain, e.g. DOE/RECON. Author (GRA)

N84-11063# European Office of Aerospace Research and Development, FPO New York 09510.
INFORMATION TECHNOLOGY AND DEVELOPMENT SERIES. VOLUME 2: INFORMATICS AND INDUSTRIAL DEVELOPMENT. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON POLICIES FOR INFORMATION PROCESSING FOR DEVELOPING COUNTRIES
F. G. Foster Nov. 1982 457 p refs Conf. held in Dublin, 9-13 Mar. 1981
(AD-A130796; EOARD-TR-83-11) Avail: NTIS HC A20/MF A01 CSCL 09/2

The International Conference on Informatics and Industrial Development, held in Dublin from 9 to 13 March 1981, was the first international meeting on this subject and had the great merit of raising a series of issues concerning both the applications of informatics to industry and the development of the informatics industry itself. The need for further in-depth research was also stressed. The keynote of the debates concerned the effective transfer of technology to developing countries as an important element in the whole development process, considering all the relevant aspects and showing to the organizations involved the importance of this issue and the need to emphasized and expand their activities of assistance to developing countries. The conference dealt with subjects of great importance to developing countries and will surely constitute one of the main contributions to the preparatory work of the IBI SPIN II Conference on Strategies and Policies for Informatics. GRA

N84-11064# Los Alamos Scientific Lab., N. Mex.
DATATRIEVE USED IN A CONTROL-SYSTEM DATABASE
Nancy E. Greene 1983 22 p Presented at the Digital Equipment Computer Users Soc. (DECUS) Symp., St. Louis, 23-27 May 1983
(Contract W-7405-eng-36)
(DE83-014187; LA-UR-83-1800; CONF-830577-2) Avail: NTIS HC A02/MF A01

Process control of the Proton Storage Ring at Los Alamos is accomplished by LSI-11/23 computers networked with a VAX-11/750. The data base contains descriptions, status, and parameters of the hardware channels and equipment connected to the LSIs. Data base entry and processing occur on the VAX, largely through DATATRIEVE user friendly procedures. Data validity is checked during and after data entry by DATATRIEVE and FORTRAN language procedures. The data base then is distilled into a machine efficient form and distributed to the LSTs and VAX for use by the process control software. An overview of the application, an overview of DATATRIEVE, examples of DATATRIEVE concepts, features of DATATRIEVE that have been especially useful, features of DATATRIEVE that have been troublesome in this project, notes about the conversion from DATATRIEVE-11 to VAX-11 DATATRIEVE, and observations on data management software in a control system environment are included. DOE

N84-11065# California Univ., Livermore. Lawrence Livermore Lab.
ADDITIONAL SYMBOLS USED IN DOUBLE-SPACED TEXT FOR WANG OIS WORD-PROCESSOR USERS
Janis A. Miller Jun. 1983 30 p
(Contract W-7405-eng-48)
(DE83-014908; UCID-19821) Avail: NTIS HC A03/MF A01

Samples of Greek symbols (and other symbols) that are on the Wang daisy printwheel but not in the form that is often required are illustrated. This techniques can be used in place of rub-ons. It applies to double spaced formats only, and involves creating format lines within the text. DOE

N84-11066# Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE 1982 INTEGRATED DATA USERS WORKSHOP
Richard J. Olson and Natalie T. Millemann 1982 193 p refs Proc. held at Reston, Va., 13 Oct. 1982
(Contract W-7405-eng-26)
(DE83-014761; CONF-8210120) Avail: NTIS HC A09/MF A01

Ways for improving the efficiency of data systems and to maintain and increase productivity are discussed. Creating long term strategies for coping with this problem is of real interest to both the producers and cnsumers ofdata and information. The pervasive and interlinked problems of society must be addressed using data that can be interrelated among physical, economic, and demograhic dimensions. The status of integrated data systems in the present climate and approaches for coping with thhe challenge of how to do more with less are addressed. Two general areas are discussed: first, technologically based internatives for improving efficiency and accessing information; and second, institutional alternatives involving options like the sharing of resources and public/private sector cooperation. GRA

N84-11067# Oak Ridge National Lab., Tenn. Applied Physical Sciences Group.
CATALOG OF THE OAK RIDGE NATIONAL LABORATORY METEOROLOGICAL TAPE LIBRARY
M. A. Bell Aug. 1983 33 p
(Contract W-7405-eng-26)
(DE83-017493; ORNL/CSD/TM-204) Avail: NTIS HC A03/MF A01

An inventory of the data tapes in the ORND Meteorological Tape Library (OMTL) is presented. The attributes of each tape, including location of the weather station (city and state), station number, standard data format, dates covered, data set name(s), and job control language considerations (record format, record, length, blocksize, tape label, and tape density), are listed for each tape. Special characteristics of each of the available standards meteorological data formats described. DOE

N84-11038# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS NOTED IN PATENT INFORMATION SYSTEM FOR CEMA MEMBER-COUNTRIES
Lotar Nikht *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 30-38 Transl. into ENGLISH from Ekonomicheskoye Sotrudnichestvo Stran Chlenov (USSR), no. 4,

Apr. 1983 p 23-26 (For primary document see N84-11034 01-80)
Avail: NTIS HC A05

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-11068# Office of Technology Assessment, Washington, D.C.
TECHNOLOGY AND EAST-WEST TRADE: AN UPDATE
1983 113 p refs
(PB83-234955; OTA-ISC-209; LC-79-600203) Avail: NTIS HC A06/MF A01 CSCL 05C

The major provisions of the 1979 Export Administration Act, highlighting those provisions which have led to problems of interpretation or execution. Major provisions in U.S. export control policy towards the Soviet union since 1979 are recounted. The impacts and implications of those events - for the domestic economy, for U.S. political relations with the NATO allies and with the Soviet Union, and for U.S. national security are discussed along with the policy alternatives open to Congress in 1983. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-11069# Committee on Commerce, Science, and Transportation (U. S. Senate).
POLICY AND LEGAL ISSUES INVOLVED IN THE COMMERCIALIZATION OF SPACE
Marcia S. Smith and Daniel Hill Zafren Washington GPO 1983 57 p refs Presented to the Comm. on Com., Sci. and Transportation, 98th Congr., 1st Sess., 23 Sep. 1983 Prepared by the Library of Congr., Congr. Res. Serv.
(GPO-21-495) Avail: Committee on Commerce, Science and Transportation

Since space commercialization is primarily a private sector responsibility, some government responsibility must be relinquished so that there can be optimal public benefit. The proper role of government in space commercialization; regulatory issues; international legal responsibility and liability; present domestic regulatory schemes; private industry perceptions; legislative proposals; and future legal problems are considered. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-11070# Argonne National Lab., Ill.
TECHNOLOGY ASSESSMENT OF PRODUCTIVE CONSERVATION IN URBAN TRANSPORTATION Final Report
S. J. LaBelle and D. O. Moses Nov. 1982 492 p refs
(Contract W-31-109-eng-38)
(DE83-012179; ANL/ES-130) Avail: NTIS HC A21/MF A01

Two strategies for the productive conservation of energy in urban transportation were compared to a reference situation in three typical cities in two plausible socioeconomic scenarios; the reference case assumed as extension of transportation policies in place in 1980. Travel patterns, revenues and costs, and vehicle purchases were forecast; the resulting impacts on the physical environment, use of energy and materials, the economy, and health and safety were examined. The group travel strategy, which included substantial additions to transit service, transit fare reductions, and gasoline and parking tax increases, yielded slightly higher energy savings than did the individual travel strategy. The latter strategy raised average new car fuel economy steadily until the year 2000 and changed nothing else relative to the in place policy. It is predicted that by 2000 the projected savings in total energy use under both strategies will exceed the savings projected under the in place policy, where total energy use will decline 16 to 34% from 1980 levels. The nature of the energy used for urban transportation will change significantly by 2000. In all situations, indirect energy use will rise to about 40% of the total from the 1980 value of 24%. The environmental impacts vary by strategy, with group travel strategy impacts in general more benign. DOE

N84-11071# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN ANALYSIS OF AN ALUMINUM-AIR BATTERY FOR VEHICLE OPERATIONS: TRANSPORTATION SYSTEMS RESEARCH
E. Behrin, R. L. Wood, J. D. Salisbury, D. J. Whisler, and C. I. Hudson 18 Mar. 1983 145 p refs
(Contract W-7405-eng-48)
(DE83-014488; UCRL-53382) Avail: NTIS HC A07/MF A01

An aluminum air battery was analyzed, various automobile propulsion systems utilizing the Al-air battery were evaluated, and the performance and cost of vehicles incorporating these propulsion systems was estimated. A preliminary engineering design was performed. A physical model and a cell performance model of a conceptual mass produced Al-air battery were constructed and work together to characterize the battery system. The physical battery model is based on a specific battery design concept and defines the mass and volume of a complete Al-air battery system. The cell performance model simulates the electrical and electrochemical characteristics of the battery. The physical model and two versions of the cell performance model - near term and optimistic - were used in a vehicle conversion analysis to evaluate three automotive propulsion systems - Al-air battery only, Al-air/ battery/secondary battery, and Al-air battery/flywheel. DOE

N84-11072# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EPA EVALUATION OF THE ATOMIZED VAPOR INJECTOR DEVICE UNDER SECTION 511 OF THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT
John C. Shelton Feb. 1983 41 p
(PB83-214684; EPA-AA-TEB-511-84-4) Avail: NTIS HC A03/MF A01 CSCL 13F

The conclusions of the Environmental Protection Agency (EPA) evaluation of the Atomized Vapor Injector device are announced. The evaluation of the Atomized Vapor Injector was conducted upon receiving an application from the inventor. The device is a vapor air bleed which bubbles air through a 50/50 mixture of water and alcohol. This vapor is said to cause more efficient combustion by atomizing the gasoline droplets and towering the engine temperature. This claimed to improve fuel economy and reduce exhaust emissions. GRA

N84-11073# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EPA EVALUATION OF THE MALPASSI FILTER KING DEVICE UNDER SECTION 511 OF THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT
Stanley L. Syria Jan. 1983 70 p refs
(PB83-214700; EPA-AA-TEB-511-83-1) Avail: NTIS HC A04/MF A01 CSCL 13F

The conclusions of the EPA evaluation of the 'Malpassi Filter King' device are announced. The evaluation of the 'Malpassi Filter King' device was conducted upon receiving an application from the marketer. The device is a gasoline pressure regulator. The 'Malpassi Filter King' device is claimed to save gasoline by

improving the fuel economy of carburetor equipped, automotive engines. GRA

N84-11074# Environmental Protection Agency, Ann Arbor, Mich. Emission Control Technology Div.
CONTROLLING EMISSIONS FROM LIGHT-DUTY MOTOR VEHICLES AT HIGH ELEVATIONS. A REPORT TO CONGRESS Final Report
Feb. 1983 321 p refs
(PB83-204883; EPA-460/3-83-001) Avail: NTIS HC A14/MF A01 CSCL 13F

This report evaluates various strategies for controlling high-altitude emissons from light-duty motor vehicles. Section 206 (f) (1) of the Clean Air Act, as amended requires all light-duty vehicles mde during or after the 1984 model year to meet the applicable Federal emission standards regardless of the altitude at which they are sold. Section 206 (f) (2) of the Clean Air Act, as amended requires the United States Environmental Protection Agency to analyze the above all altitude requirement, in addition to separate proportional emission standards for high-altitude areas. This document fulfills that Congressional mandate. In addition this report also analyzes the consequences of high-altitude standards for light-duty trucks and possible revisions in the current low-altitude standards. Author (GRA)

N84-11075# North Carolina Univ., Chapel Hill. Highway Safety Research Center.
STATISTICAL EVALUATION OF THE EFFECTIVENESS OF THE 1976 VERSION OF THE FMVSS 301: FUEL SYSTEM INTEGRITY Final Report, 2 Jun. 1981 - 15 Apr. 1982
Donald W. Reinfurt Nov. 1982 75 p refs
(Contract DTN22-81-C-06006)
(PB83-205211; DOT-HS-806-365) Avail: NTIS HC A04/MF A01 CSCL 13F

The study data consists of police narratives from North Carolina crashes occurring in the period 1971-81 along with crash data for Maryland for the period 1977-80. Logistic regression models were utilized in both instances to accommodate the combination of continuous and discrete data as well as the rarity of the phenomenon of post-crash fires (N = 402 for North Carolina While N = 159 for Maryland). The models controlled for the most important explanatory variables determined by Reinfurt (1981). These included car age, impact site, speed, and calendar year in NC and car age, impact site and vehicle damage severity for MD. Author (GRA)

N84-11076# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
APPLICATION OF ACTIVE AND PASSIVE SUSPENSION TECHNIQUES TO IMPROVE HIGH SPEED GROUND VEHICLE PERFORMANCE Final Report
J. K. Hedrick, D. N. Wormley, F. Buzan, L. C. Chen, and M. Partridge 5 Oct. 1982 210 p refs
(Contract DTRS56-80-C-00018)
(PB83-224576; DOT/RSPA/DMA-50/82/20) Avail: NTIS HC A10/MF A01 CSCL 13F

Suspension designs for high speed ground vehicles, in particular in those applications where restricted operating envelopes limit the improvements that can be made by conventional means were studied. The application area chosen was the lateral ride quality of intercity passenger trains. GRA

N84-11035# Joint Publications Research Service, Arlington, Va.
THE SOCIALIST AND DEVELOPING COUNTRIES: TECHNOLOGY TRANSFER
Stanislav Simanovsky *In its* USSR Rept.: Sci. and Technol. Policy, No. 18 (JPRS-84484) 6 Oct. 1983 p 1-15 Transl. into ENGLISH from Foreign Trade (USSR), no. 3, (For primary document see N84-11034 01-80)
Avail: NTIS HC A05 Mar. 1983 p 28-35

88 SPACE SCIENCES (GENERAL)

N84-10384# Joint Publications Research Service, Arlington, Va.
WORK OF ESTONIAN ASTROPHYSICS AND ATMOSPHERIC PHYSICS INSTITUTE DESCRIBED
Juhan Toomsoo *In its* USSR Rept.: Sci. and Technol., No. 19 (JPRS-84497) 7 Oct. 1983 p 97-100 refs Transl. into ENGLISH from Noorte Haal (Tallinn), 12 Apr. 1983 p 2 (For primary document see N84-10348 01-31)
Copyright. Avail: NTIS HC A06

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-11077*# Indiana Univ., Bloomington.
HEAO 1-A1 OBSERVATIONS OF AM HERCULIS AND RELATED OBJECTS Final Technical Report, 20 Aug. 1980 - 20 Aug. 1983
Richard H. Durisen and James N. Imamura 1983 12 p refs
(Contract NAG8-362)
(NASA-CR-170907; NAS 1.26:170907) Avail: NTIS HC A02/MF A01 CSCL 03A

Several theoretical investigations concerned with the time variability of AM Herculis objects, wee conducted, and HEAO 1-A1 observations of these X-ray sources were used to test the theoretical models. Author

N84-11078# Astronomisches Inst., Bonn (West Germany).
THE CHARACTERISTICS OF OH/IR OBJECTS, INFRARED STARS WITH OH MASER EMISSION [ZUR NATUR VON OH/IR-OBJEKTEN, INFRAROTSTERNEN MIT OH-MASER-EMISSION]
Dieter Engels 1982 92 p refs In GERMAN
(IA-Publ-95; ISSN-0340-9821) Avail: NTIS HC A05/MF A01

Over 1,000 MHz masers showing a characteristic double-peaked velocity (OH/IR sources) were discovered by radio surveys and could not identified optically. They are associated with infrared objects (OH/IR stars) of which the evolutionary stage was unknown. The nature of these OH/IR stars is analyzed. They were observed several years in the infrared spectral region between 1 and 30 microns to prove their variability. By comparison with known variable stars, showing the same characteristic OH maser emission, they must be considered as extension of the optically known Mira stars toward greater masses and longer periods. The long period pulsation of these 'infrared Mira stars' is connected with enhanced mass loss, which causes the formation of optically thick circumstellar shells. These dust shells are absorbing most of the optical emission of the central star. The classification of the OH/IR stars as Mira variables implies that also intermediate mass stars are going through a phase of long period pulsation during their evolution on the asymptotic giant branch. Because of their strong mass loss, stars in this evolutionary stage obviously can be identified only in the infrared or if present, by their OH maser emission. N.W.

N84-11079# Brookhaven National Lab., Upton, N. Y.
STATUS OF P714 - LAPDOG
L. Ahrens, S. Aronson, P. Connolly, B. Gibbard, M. Murtagh, S. Protopopescu, H. Weisberg, P. Yamin, J. Callas, D. Cutts et al 1 Feb. 1983 36 p refs
(Contract DE-AC02-80ER-10699)
(DE83-013613; DOE/ER-10699/T2) Avail: NTIS HC A03/MF A01

Physics motivations, detector development, Monte Carlo studies and overall perspectives of the experiment are summarized. LAPDOG was conceived as a high resolution electromagnetic detector for ISAbelle. DOE

N84-11080# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Physical Sciences, Mathematics, and Resources.
CHALLENGES TO ASTRONOMY AND ASTROPHYSICS: WORKING DOCUMENTS OF THE ASTRONOMY SURVEY COMMITTEE
National Academy Press 1983 296 p
(PB83-203984; ISBN-0-309-03335-7; LC-83-60509) Avail: NTIS HC A13/MF A01 CSCL 03A

This report is the papers of seven working groups in support of the study Astrophysics for the 1980's, volumes 1 and 2. The groups studied solar physics, planetary science, galactic astronomy, extragalactic astronomy, related areas of science; astrometry, and search for extraterrestrial intelligence. Author (GRA)

N84-11081# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 465, MAY 1983. PART 2: (COMPREHENSIVE REPORTS). DATA FOR NOVEMBER 1982, OCTOBER 1980 AND MISCELLANEA
Helen E. Coffey May 1983 125 p refs
(PB83-228551; SGD-465-Pt-2; NOAA-83071202) Avail: NTIS HC06/MF A01 CSCL 03A

Solar flares, solar radio emission, solar X-ray radiation, and mass ejections from the Sun are included. Author (GRA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-11082*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RAPID X-RAY VARIABILITY OF ACTIVE GALAXIES Ph.D. Thesis
Allyn Field Tennant, Jr. Sep. 1983 166 p refs
(NASA-TM-85101; NAS 1.15:85101) Avail: NTIS HC A08/MF A01 CSCL 03B

Active galactic nuclei are luminous sources of X-rays. The thesis that the X-rays are generated within 10 gravitational radii from the central object is tested. A very sensitive search for rapid (< 1 day) X-ray variability from active galaxies was made. Author

N84-11083*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CIRCINUS X-1: A LABORATORY FOR STUDYING THE ACCRETION PHENOMENON IN COMPACT BINARY X-RAY SOURCES Ph.D. Thesis - Maryland Univ.
Julia Lee Robinson-Saba Aug. 1983 340 p refs
(NASA-TM-85095; NAS 1.15:85095) Avail: NTIS HC A15/MF A01 CSCL 03A

Observations of the binary X-ray source Circinus X-1 provide samples of a range of spectral and temporal behavior whose variety is thought to reflect a broad continuum of accretion conditions in an eccentric binary system. The data support an identification of three or more X-ray spectral components, probably associated with distinct emission regions. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-11084*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATURN'S OUTER MAGNETOSPHERE
A. W. Schardt, K. W. Behannon, J. F. Carbary, A. Eviatar, R. P. Lepping, and G. L. Siscoe Sep. 1983 66 p refs Submitted for publication
(NASA-TM-85105; NAS 1.15:85105) Avail: NTIS HC A04/MF A01 CSCL 03B

Similarities between the Saturnian and terrestrial outer magnetosphere are examined. Saturn, like Earth, has a fully developed magnetic tail, 80 to 100 RS in diameter. One major difference between the two outer magnetospheres is the hydrogen and nitrogen torus produced by Titan. This plasma is, in general, convected in the corotation direction at nearly the rigid corotation speed. Energies of magnetospheric particles extend to above 500 keV. In contrast, interplanetary protons and ions above 2 MeV have free access to the outer magnetosphere to distances well below the Stormer cutoff. This access presumably occurs through the magnetotail. In addition to the H+, H2+, and H3+ ions primarily of local origin, energetic He, C, N, and O ions are found with solar composition. Their flux can be substantially enhanced over that of interplanetary ions at energies of 0.2 to 0.4 MeV/nuc. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-11085# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
PREDICTION OF SOLAR-TERRESTRIAL DISTURBANCES: DECAY PHASE OF ENERGETIC PROTON EVENTS Final Scientific Report, 1 Jul. 1979 - 30 Sep. 1982
Edmond C. Roelof Hanscom AFB, Mass. AFGL Oct. 1982 20 p refs
(Contracts N00024-78-C-5384; MIPR-FY7121-82-00009; MIPR-FY7121-79-00011; MIPR-FY7121-80-00003; MIPR-FY7121-81-00001; AF Proj. 2311)
(AD-A130103; AFGL-TR-82-0342) Avail: NTIS HC A02/MF A01 CSCL 04/1

The decay phase of solar proton events, as observed at Earth, depends strongly on the proton injection history, the distribution of the proton population in solar longitude, and the state of the interplanetary medium. In an attempt to gain an additional diagnostic of these complex conditions, the evolution of the flux anisotropy is examined, both theoretically and observationally. In relatively simple events, the component of the flux anisotorpy parallel to the interplanetary magnetic field proves to be a useful indicator. In more complicated events additional information from solar wind, magnetic field, and lower energy (< 1 MeV) ions would appear to be necessary. Research papers on these related quantities are also cited. Author (GRA)

N84-11086*# Stanford Univ., Calif. Inst. for Plasma Research.
DETECTION OF SOLAR GRAVITY MODE OSCILLATIONS
Philippe Delache (CNRS) and Philip H. Scherrer Apr. 1983 18 p refs Sponsored in part by the Max C. Fleischmann Foundation and the Centre National de la Recherche Scientifique and the Ministere des Relations Exterieures
(Contract NAS5-24420; Grant NGR-05-020-559; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
(NASA-CR-174469; NAS 1.26:174469; AD-A130289; SU-IPR-957) Avail: NTIS HC A02/MF A01 CSCL 03/2

An analysis of solar velocity data obtained at the Stanford Solar Observatory shows the existence of solar global oscillations in the range 45 to 105 microHz (160 to 370 minutes). These oscillations are interpreted as internal gravity modes of degree l = 1 and l = 2. A good estimate of the order of the modes has also been made. Author (GRA)

N84-11087# Air Force Geophysics Lab., Hanscom AFB, Mass.
PROCEEDINGS OF THE STIP (STUDY OF TRAVELLING INTERPLANETARY PHENOMENA) SYMPOSIUM ON SOLAR RADIO

ASTRONOMY, INTERPLANETARY SCINTILLATIONS AND COORDINATION WITH SPACECRAFT
M. A. Shea, D. F. Smart, D. J. McLean, and G. J. Nelson 27 Dec. 1982 223 p refs Symp. held in Narrabri, N.S.W., Australia, 28-30 Nov. 1979
(AF Proj. 2311)
(AD-A130687; AFGL-TR-82-0390; AFGL-SR-233) Avail: NTIS HC A10/MF A01 CSCL 03/2

This report is a compilation of 16 papers presented at the Study of Travelling Interplanetary Phenomena (STIP) Symposium on Solar Radio Astronomy, Interplanetary Scintillations, and Coordination with Spacecraft, held 28-30 November 1979 at the Culgoora Radio Observatory in Narrabri, N.S.W., Australia. These papers span a range of multi-disciplinary studies of various solar emissions propagating from the Sun through the interplanetary medium to the Earth and beyond to Jupiter. This includes papers on solar radio emissions; solar region evolution; solar particle propagation; the modeling of solar induced disturbances in the interplanetary medium; and the use of radio measurements to probe the turbulence of the interplanetary medium. Theoretical studies and analyses, computer simulation and in situ measurements of these phenomena are included. The subjects covered are solar physics, solar radio astronomy, interplanetary scintillation measurements, cometary studies, direct spacecraft measurements and energetic solar particle propagation in the interplanetary medium. Author (GRA)

N84-11088# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOLAR MAGNETIC FIELDS STUDY Final Report, 1 May 1978 - 28 Feb. 1983
Robert C. Smithson Hanscom AFB, Mass. AFGL 28 Feb. 1983 41 p refs
(Contract F19628-78-C-0087; AF Proj. 2311)
(AD-A130491; LMSC/D913065; AFGL-TR-83-0071) Avail: NTIS HC A03/MF A01 CSCL 03/2

This report describes a series of observations of solar magnetic fields. These observations were made using narrow band filters and active seeing correction systems developed at the Lockheed Palo Alto Research Laboratories. New data has been obtained concerning the strength and size of solar magnetic field elements, and which set an upper limit of the strength of the inner network fields. A number of new devices were first used for scientific observations under this contract. These included new tunable birefringent filters, an image motion compensation system, and most recently a 57-actuator seeing compensation system. The performance of these devices is described in detail in this report. Author (GRA)

N84-11089# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 462, FEBRUARY 1983. (SUPPLEMENT). EXPLANATION OF DATA REPORTS
Feb. 1983 82 p 3 Vol.
(PB83-216234; SGD-462) Avail: NTIS HC A05/MF A01 CSCL 03B

This supplement describes and explains the data in the monthly publication Solar-Geophysical Data. GRA

N84-11090# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA, NUMBER 463, MARCH 1983. PART 2: (COMPREHENSIVE REPORTS). DATA FOR SEPTEMBER 1982, SEPTEMBER 1980 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 462 (SUPPLEMENT) FEBRUARY 1983
Helen E. Coffey, ed. Mar. 1983 100 p 3 Vol.
(PB83-216317; SGD-463-Pt-2; NOAA-83060807-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 03B

Tables show solar flares; solar radio emission; solar X-ray radiation; mass ejections from the Sun. GRA

N84-11091# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 464, APRIL 1983. PART 1: PROMPT REPORT. DATA FOR MARCH 1983, FEBRUARY 1983 AND LATE DATA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 462 (SUPPLEMENT) FEBRUARY 1983
Helen E. Coffey, ed. Apr. 1983 102 p
(PB83-222489; SGD-464-Pt-1; NOAA-83062202-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

The followng topics are considered: alert periods; daily solar indices; solar flares; solar radio emission; inferred interplanetary magnetic field polarities; mean solar magnetic field; daily solar activity centers; sudden ionospheric distrubances; cosmic rays; geomagnetic indicates; and radio propagation indices. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-11092# Utah Univ., Salt Lake City.
THE HIGH ZENITH ANGLE LIMITS OF COSMIC RAY ACCESS TO AN EARTH SATELLITE
David J. Cooke Mar. 1983 22 p refs
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The question of the high zenith angle limits pertaining to access of charged cosmic ray particles of any given rigidity to an Earth satellite is an important one to investigators who rely on the presence of the solid Earth and atmosphere to screen a satellite from upwards moving particles. The trajectory parameterization method has been used to elucidate the general characteristics of the different kinds of solid angle region that can be distinguished relative to a satellite (or more generally to any given point within the geomagnetic field). These regions are: Those into which particle may be allowed, those into which particles are forbidden because of the local blocking effect of the earth and atmosphere, and those regions into which charged particles may have access via means of long bound or quasi bound periodic trajectories. This report presents some of the phenomenology associated with these regions, and discusses aspects of their latitude, longitude, zenith, azimuth and rigidity dependence. Author (GRA)

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Achievemens of the space program are summerized in the area of communication, Earth resources, environment, space sciences, transportation, aeronautics, and space energy. Space program activities of the various deprtments and agencies of the Federal Government are discussed in relation to the agencies' goals and policies. Records of U.S. and world spacecraft launchings, successful U.S. launches for 1982, U.S. launched applications and scientific satellites and space probes since 1975, U.S. and Soviet manned spaceflights since 1961, data on U.S. space launch vehicles, and budget summaries are provided. The national space policy and the aeronautical research and technology policy statements are included. J.M.S.

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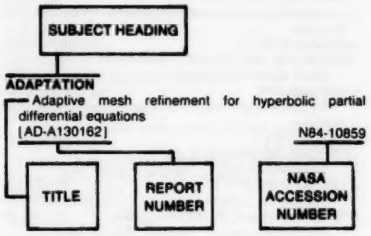

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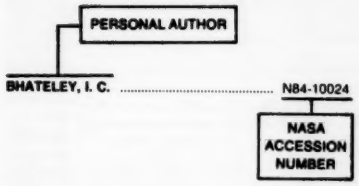

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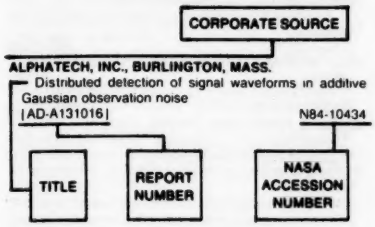

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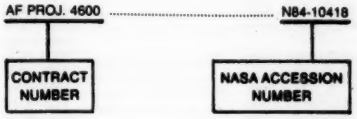

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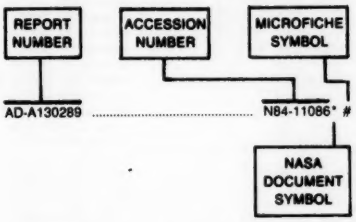

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NASA-CR-172218 ..... N84-10836* #
NASA-CR-172219 ..... N84-10831* #
NASA-CR-172223 ..... N84-10114* #
NASA-CR-172226 ..... N84-10769* #
NASA-CR-172233 ..... N84-10017* #
NASA-CR-172241 ..... N84-10837* #
NASA-CR-172249 ..... N84-10501* #
NASA-CR-174450 ..... N84-10173* #
NASA-CR-174464 ..... N84-10660* #
NASA-CR-174466 ..... N84-10032* #
NASA-CR-174467 ..... N84-10679* #
NASA-CR-174468 ..... N84-10678* #
NASA-CR-174469 ..... N84-11086* #
NASA-CR-174470 ..... N84-11023* #
NASA-CR-174472 ..... N84-10677 #
NASA-CR-174522 ..... N84-10641* #
NASA-CR-174523 ..... N84-10642* #
NASA-CR-174531 ..... N84-10266* #
NASA-CR-174532 ..... N84-10778* #
NASA-CR-174533 ..... N84-10401* #
NASA-CR-174534 ..... N84-10267* #
NASA-CR-174535 ..... N84-11046* #
NASA-CR-174536 ..... N84-10608* #
NASA-CR-174540 ..... N84-10910* #
NASA-CR-174541 ..... N84-10366* #
NASA-CR-174546 ..... N84-10644* #
NASA-CR-174552 ..... N84-10177* #

NASA-EP-165 ..... N84-10172* #

NASA-ICASE-83-33 ..... N84-10831* #

NASA-SP-459 ..... N84-10718* #
NASA-SP-7937(165) N84-10008*

NASA-TM-77065 ..... N84-10315* #
NASA-TM-77109 ..... N84-10452* #
NASA-TM-77242 ..... N84-10370* #
NASA-TM-82535 ..... N84-10112* #
NASA-TM-82546 ..... N84-10183* #
NASA-TM-83403 ..... N84-10665* #
NASA-TM-83449 ..... N84-10310* #
NASA-TM-83483 ..... N84-10664* #
NASA-TM-83516 ..... N84-10405* #
NASA-TM-83961 ..... N84-10923* #
NASA-TM-84343 ..... N84-10021* #
NASA-TM-84373 ..... N84-10043* #
NASA-TM-84375 ..... N84-10498* #
NASA-TM-84377 ..... N84-10019* #
NASA-TM-84391 ..... N84-10049* #
NASA-TM-84397 ..... N84-10042* #
NASA-TM-84398 ..... N84-10041* #
NASA-TM-84400 ..... N84-10732* #
NASA-TM-84409 ..... N84-10018* #
NASA-TM-84411 ..... N84-10724* #
NASA-TM-85072 ..... N84-10692* #
NASA-TM-85095 ..... N84-11083* #
NASA-TM-85101 ..... N84-11082* #
NASA-TM-85105 ..... N84-11084* #
NASA-TM-85430 ..... N84-10037* #
NASA-TM-85454 ..... N84-11093* #
NASA-TM-85474 ..... N84-10011* #
NASA-TM-85489 ..... N84-10034* #
NASA-TM-85679 ..... N84-10611* #
NASA-TM-85680 ..... N84-10911* #
NASA-TM-85682 ..... N84-10609* #
NASA-TM-85683 ..... N84-10610* #
NASA-TM-85687 ..... N84-10538* #
NASA-TM-85838 ..... N84-10834* #
NASA-TM-85848 ..... N84-10079* #
NASA-TM-85850 ..... N84-10020* #

NASA-TP-1024 ..... N84-10504* #
NASA-TP-2004 ..... N84-10913* #
NASA-TP-2119 ..... N84-10025* #
NASA-TP-2147 ..... N84-10675* #

NAVHLTHRSCHC-83-4 ..... N84-10736 #

NBDL-83R001 ..... N84-10461 #
NBDL-83R002 ..... N84-10734 #
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NBS-BSS-151 ..... N84-10376 #
NBS-BSS-155 ..... N84-11029 #
NBS-BSS-155-APP-J ..... N84-11030 #

NBS-TN-1176 ..... N84-10813 #

NBSIR-83-1684 ..... N84-10330 #
NBSIR-83-2666 ..... N84-10537 #
NBSIR-83-2708 ..... N84-10555 #
NBSIR-83-2710 ..... N84-10558 #

NCAR/TN-210-STR ..... N84-10715 #

NCEL-CR-83.028 ..... N84-10667 #

NCSC-TECH-MAN-4110-1-83 ..... N84-10761 #

NCSC-TM-378-83 ..... N84-10762 #

NEPRF-CR-83-05 ..... N84-10696 #

NF/CEE-82132-VOL-1 ..... N84-10382 #

NOAA-DR-ERL-GFDL-1-PT-1 ..... N84-10709 #

NOAA-NWS-CROP-8 ..... N84-10711 #

NOAA-TM-ERL-ARL-121 ..... N84-10717 #

NOAA-TM-ERL-ESG-2 ..... N84-10040 #

NOAA-TM-ERL-WPL-109 ..... N84-10446 #
NOAA-TM-ERL-WPL-110 ..... N84-10690 #

NOAA-TM-NWS-CR-69 ..... N84-10710 #

NOAA-TR-OTES-11 ..... N84-10830 #

NOAA-83060807-PT-2 ..... N84-11090 #
NOAA-83061303 ..... N84-10722 #
NOAA-83061306-VOL-27-NO-2 ..... N84-10708 #
NOAA-83061501 ..... N84-10446 #
NOAA-83061502 ..... N84-10690 #
NOAA-83061605-PT-1 ..... N84-10709 #
NOAA-83062001 ..... N84-10393 #
NOAA-83062002 ..... N84-10394 #
NOAA-83062003 ..... N84-10392 #
NOAA-83062004 ..... N84-10395 #
NOAA-83062005 ..... N84-10397 #
NOAA-83062028 ..... N84-10398 #
NOAA-83062036 ..... N84-10396 #
NOAA-83062202-PT-1 ..... N84-11091 #
NOAA-83062205 ..... N84-10447 #
NOAA-83062206 ..... N84-10040 #
NOAA-83062207 ..... N84-10711 #
NOAA-83062209 ..... N84-10710 #
NOAA-83062702 ..... N84-10713 #
NOAA-83062901 ..... N84-10556 #
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NOAA-83071301 ..... N84-10716 #
NOAA-83071406 ..... N84-10657 #
NOAA-83071810 ..... N84-10717 #
NOAA/TM/ERL/RFC-12 ..... N84-10447 #

NOAA/TM/NWS/FCST-28 ..... N84-10716 #

NOC-CR-167 ..... N84-10427 #

NOCC/JTWC-TN-82-1 ..... N84-10700 #

NORDA-TN-193 ..... N84-10720 #
NORDA-TN-205 ..... N84-10438 #

NOSC-CR-159 ..... N84-10482 #
NOSC-CR-168 ..... N84-10966 #

NOSC-TD-579 ..... N84-11047 #

NPRDC-SR-83-33 ..... N84-10750 #

NPS54-83-006 ..... N84-11049 #
NPS55-83-013 ..... N84-10072 #
NPS55-83-019 ..... N84-10698 #

NRC-21230 ..... N84-10028 #
NRC-21274 ..... N84-10029 #

NRL-MR-5076 ..... N84-10568 #
NRL-MR-5117 ..... N84-10681 #
NRL-MR-5118 ..... N84-10984 #
NRL-MR-5119 ..... N84-10660 #
NRL-MR-5120 ..... N84-10684 #
NRL-MR-5121 ..... N84-10915 #
NRL-MR-5133 ..... N84-10682 #
NRL-MR-5143 ..... N84-10869 #
NRL-MR-5148 ..... N84-10977 #

NRL-TR-1 ..... N84-10969 #
NRL-TR-4 ..... N84-10540 #

NRL-8698 ..... N84-10420 #
NRL-8700 ..... N84-10425 #
NRL-8708 ..... N84-10414 #
NRL-8709 ..... N84-10426 #
NRL-8716 ..... N84-10456 #
NRL-8728 ..... N84-10437 #

NRTC-83-09R ..... N84-10560 #

NSF-83-29 ..... N84-11052 #
NSF-83-308 ..... N84-11057 #

NSF/CEE-82133-VOL-2-APP ..... N84-10383 #
NSF/CEE-82141 ..... N84-10388 #
NSF/CEE-82142 ..... N84-10391 #

NSF/ECS-82078-PT-1 ..... N84-10885 #
NSF/ECS-82079-PT-2 ..... N84-10886 #
NSF/ECS-83002 ..... N84-10887 #
NSF/ECS-83003 ..... N84-10901 #
NSF/ECS-83006 ..... N84-10884 #

NSF/PRA-83013 ..... N84-11052 #
NSF/PRA-83014 ..... N84-11051 #
NSF/PRA-83015 ..... N84-11050 #

NSWC-TR-82-380 ..... N84-10338 #

NSWC/TR-82-172 ..... N84-10619 #
NSWC/TR-83-30 ..... N84-10233 #
NSWC/TR-83-66 ..... N84-10458 #

NTSB/AAR-83/03 ..... N84-10036 #

NUREG/CR-2570-REV-1 ..... N84-10629 #
NUREG/CR-2839 ..... N84-10878 #
NUREG/CR-2905 ..... N84-10522 #
NUREG/CR-3156 ..... N84-10478 #
NUREG/CR-3225 ..... N84-10236 #

NUSC-TR-6931 ..... N84-10914 #

NUSC/TD-6148 ..... N84-10872 #

NYSERDA-82-35 ..... N84-10669 #

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OEHL-TR-82-5 ..... N84-10052 #

ONR-83-AE ..... N84-10740 #

ORNL/CSD-111 ..... N84-10728 #
ORNL/CSD-120 ..... N84-10882 #

ORNL/CSD/TM-190 ..... N84-10878 #
ORNL/CSD/TM-204 ..... N84-11067 #

ORNL/SUB-79-7685/1 ..... N84-10484 #

ORT-1-068-IDA(2) ..... N84-10655 #

OSD/FSTC-82-347 ..... N84-10822 #
OSD/FSTC-82-348 ..... N84-10821 #
OSD/FSTC-82/273-REV-2.11 ..... N84-10826 #
OSD/FSTC-82/274-REV-2.20 ..... N84-10776 #
OSD/FSTC-82/275-REV-2.00 ..... N84-10629 #
OSD/FSTC-82/325 ..... N84-10828 #
OSD/FSTC-82/326 ..... N84-10817 #
OSD/FSTC-82/327 ..... N84-10820 #
OSD/FSTC-82/328 ..... N84-10818 #
OSD/FSTC-82/330 ..... N84-10827 #
OSD/FSTC-82/331 ..... N84-10816 #
OSD/FSTC-82/332 ..... N84-10825 #
OSD/FSTC-82/341 ..... N84-10815 #
OSD/FSTC-82/342 ..... N84-10823 #
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OTA-ISC-209 ..... N84-11068 #

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OU-AMNE-83-2 ..... N84-10617 #

OWRT-A-063-IDA(2) ..... N84-10730 #
OWRT-A-063-NDKA(1) ..... N84-10248 #
OWRT-A-132-MONT(1) ..... N84-10714 #

OWRT-B-055-NDAK(1) ..... N84-10247 #

OWRT-C-00101-D(0447)(1) ..... N84-10246 #

PAM-156 ..... N84-10673 #

PB83-203984 ..... N84-11080 #
PB83-204818 ..... N84-10330 #
PB83-204883 ..... N84-11074 #
PB83-205211 ..... N84-11075 #
PB83-205518 ..... N84-10379 #
PB83-205567 ..... N84-10380 #
PB83-205971 ..... N84-10381 #
PB83-207306 ..... N84-10375 #
PB83-207464 ..... N84-10376 #
PB83-207597 ..... N84-10377 #
PB83-209155 ..... N84-10245 #
PB83-210757 ..... N84-10378 #
PB83-211201 ..... N84-11053 #
PB83-213637 ..... N84-11052 #
PB83-214106 ..... N84-11050 #
PB83-214114 ..... N84-11051 #
PB83-214684 ..... N84-11072 #
PB83-214700 ..... N84-11073 #
PB83-216234 ..... N84-11089 #
PB83-216317 ..... N84-11090 #
PB83-219675 ..... N84-10494 #
PB83-219758 ..... N84-10655 #
PB83-220467 ..... N84-10613 #
PB83-220483 ..... N84-10722 #
PB83-220491 ..... N84-10708 #
PB83-220764 ..... N84-10446 #
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PB83-221168 ..... N84-10396 #
PB83-221374 ..... N84-10397 #
PB83-221713 ..... N84-10730 #
PB83-221887 ..... N84-10398 #
PB83-222281 ..... N84-10690 #
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PB83-222489 ..... N84-11091 #
PB83-222562 ..... N84-10040 #
PB83-222588 ..... N84-10447 #
PB83-222604 ..... N84-10710 #
PB83-222612 ..... N84-10711 #
PB83-222711 ..... N84-10555 #
PB83-223057 ..... N84-10246 #
PB83-223172 ..... N84-10748 #
PB83-223206 ..... N84-10382 #
PB83-223214 ..... N84-10383 #
PB83-223297 ..... N84-10388 #
PB83-224014 ..... N84-10556 #
PB83-224071 ..... N84-10537 #
PB83-224121 ..... N84-10559 #
PB83-224204 ..... N84-10247 #
PB83-224360 ..... N84-10749 #
PB83-224576 ..... N84-11076 #
PB83-224824 ..... N84-10389 #
PB83-224832 ..... N84-10390 #
PB83-224840 ..... N84-10399 #
PB83-224857 ..... N84-10713 #
PB83-225177 ..... N84-11033 #
PB83-225375 ..... N84-10746 #
PB83-225722 ..... N84-10712 #
PB83-225763 ..... N84-10385 #
PB83-225870 ..... N84-10558 #
PB83-226340 ..... N84-10303 #
PB83-226563 ..... N84-10400 #
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PB83-226704 ..... N84-11055 #
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PB83-227256 ..... N84-10823 #
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PB83-227280 ..... N84-10820 #
PB83-227298 ..... N84-10819 #
PB83-227306 ..... N84-10818 #
PB83-227314 ..... N84-10884 #
PB83-227330 ..... N84-11054 #
PB83-228122 ..... N84-10817 #
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PB83-228171 ..... N84-10815 #
PB83-228213 ..... N84-11057 #
PB83-228361 ..... N84-10557 #
PB83-228379 ..... N84-10347 #
PB83-228403 ..... N84-11031 #
PB83-228429 ..... N84-10384 #
PB83-228460 ..... N84-10048 #
PB83-228502 ..... N84-10598 #
PB83-228551 ..... N84-11081 #
PB83-228569 ..... N84-10830 #
PB83-228951 ..... N84-10901 #
PB83-229013 ..... N84-10672 #
PB83-229591 ..... N84-10747 #
PB83-231068 ..... N84-10715 #
PB83-231076 ..... N84-10012 #
PB83-231209 ..... N84-10743 #
PB83-231324 ..... N84-10691 #
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PB83-232744 ..... N84-10599 #
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PB83-233023 ..... N84-10717 #
PB83-233247 ..... N84-10828 #
PB83-233254 ..... N84-10827 #
PB83-233270 ..... N84-10731 #
PB83-233452 ..... N84-10776 #
PB83-233460 ..... N84-10826 #
PB83-233478 ..... N84-10829 #
PB83-234955 ..... N84-11068 #
PB83-236091 ..... N84-10302 #
PB83-910403 ..... N84-10036 #

PD-BRA-82-278R ..... N84-10432 #

PD-BSI-83-293R ..... N84-10976 #

PDRC-83-03 ..... N84-10846 #

PFC/RR-83-13 ..... N84-10982 #

PLASMA-PHYSICS-PUB-83-01 ..... N84-10458 #

PMIC-MA03-469-28 ..... N84-10171* #

PNL-SA-9566 ..... N84-10707 #
PNL-SA-10400 ..... N84-10295 #
PNL-SA-10604 ..... N84-10341 #
PNL-SA-10999 ..... N84-10033 #
PNL-SA-11067 ..... N84-10596 #
PNL-SA-11317 ..... N84-10806 #
PNL-SA-11332 ..... N84-10956 #

PNL-3960 ..... N84-10107 #
PNL-4367 ..... N84-10706 #
PNL-4535 ..... N84-10523 #

POLY-EE/CE-83-001 ..... N84-10845 #

PWA-5697-65 ..... N84-10332* #

PWA/GPD-FR-16823 ..... N84-10076 #

QR-2 ..... N84-10463 #
QR-6 ..... N84-11005 #
QR-10 ..... N84-10468 #

RADC-TR-82-316 ..... N84-10433 #
RADC-TR-82-326 ..... N84-10962 #
RADC-TR-82-337 ..... N84-10418 #
RADC-TR-83-12 ..... N84-10649 #
RADC-TR-83-26 ..... N84-10860 #
RADC-TR-83-31 ..... N84-10279 #
RADC-TR-83-32 ..... N84-10460 #
RADC-TR-83-33 ..... N84-10844 #
RADC-TR-83-35 ..... N84-10469 #
RADC-TR-83-39 ..... N84-10790 #
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RADC-TR-83-59 ..... N84-10781 #
RADC-TR-83-62 ..... N84-10435 #
RADC-TR-83-109 ..... N84-10411 #

RANRL-TN(EXT)-1/83 ..... N84-10436 #
RANRL-TN(EXT)-3/82-PT-1 ..... N84-10918 #

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RDA-TR-119930-001 ..... N84-10441 #

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REPT-82-16 ..... N84-10391 #
REPT-83-1 ..... N84-10796 #
REPT-83-47 ..... N84-10022* #
REPT-83-54 ..... N84-10837* #
REPT-83-55 ..... N84-10501* #
REPT-2313 ..... N84-10375 #
REPT-8213 ..... N84-10413 #
REPT-8302-ONR ..... N84-10757 #
REPT-8303-22 ..... N84-10543 #

RFP-3424-1-VOL-1 ..... N84-10668 #
RFP-03388 ..... N84-10289 #

RLS-TR-580-2 ..... N84-10643* #

RR-U3-04435 ..... N84-10646* #

RRR-83-1 ..... N84-10646* #

R83-956077-1-VOL-1 ..... N84-10613* #
R83-956077-2-VOL-2 ..... N84-10614* #

SAI-83-002-DAY ..... N84-10648* #
SAI-84-176-WA ..... N84-10963 #

SAND-82-1947C ..... N84-10588 #
SAND-82-1962C ..... N84-10529 #
SAND-82-2213C ..... N84-10329 #
SAND-82-2788C ..... N84-11009 #
SAND-83-0009C ..... N84-10473 #
SAND-83-0046C ..... N84-10474 #
SAND-83-0086 ..... N84-10881 #
SAND-83-0100C ..... N84-10971 #
SAND-83-0108C ..... N84-10570 #
SAND-83-0121C ..... N84-10465 #
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SAND-83-0384 ..... N84-10241 #
SAND-83-0414 ..... N84-10489 #
SAND-83-0537C ..... N84-11016 #
SAND-83-0595C ..... N84-10487 #
SAND-83-0730 ..... N84-10519 #
SAND-83-0790C ..... N84-11024 #
SAND-83-0919C ..... N84-10577 #
SAND-83-1106C ..... N84-10974 #
SAND-83-1124C ..... N84-10628 #
SAND-83-1194C ..... N84-11010 #
SAND-83-1239C ..... N84-10986 #
SAND-83-1359C ..... N84-11021 #
SAND-83-1604C ..... N84-10812 #
SAND-83-8223 ..... N84-10293 #
SAND-83-8229 ..... N84-10527 #
SAND-83-00290 ..... N84-10294 #
SAND-83-01610 ..... N84-10549 #

SAR-5 ..... N84-10581* #

SCEGIT-82-107-VOL-1 ..... N84-10382 #
SCEGIT-83-107-VOL-2-APP ..... N84-10383 #

SCIENTIFIC-3 ..... N84-10676 #
SCIENTIFIC-4 ..... N84-11092 #

SC5117.14FR ..... N84-10316 #

SD-TR-83-27 ..... N84-10788 #

SERI/TP-215-1954 ..... N84-10921 #

SERI/TR-252-1614 ..... N84-10533 #

SGD-462 ..... N84-11089 #
SGD-463-PT-2 ..... N84-11090 #
SGD-464-PT-1 ..... N84-11091 #
SGD-465-PT-2 ..... N84-11081 #

SIO-83-5 ..... N84-10687 #

SLAC-PUB-3010 ..... N84-10773 #
SLAC-PUB-3033 ..... N84-10942 #
SLAC-PUB-3060 ..... N84-10943 #
SLAC-PUB-3074 ..... N84-10443 #
SLAC-PUB-3077 ..... N84-10480 #
SLAC-PUB-3084 ..... N84-10938 #

SMU-WT-7 ..... N84-10548 #

SMU/DS/TR-176 ..... N84-10888 #
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SSD-83-0094-2-VOL-2 ..... N84-10176* #

SSL-30-83 ..... N84-10583* #
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